Electrical World and Engineer

THE CONSOLIDATION OF "THE ELECTRICAL WORLD" AND "ELECTRICAL ENGINEER."

VOL. XLI. NEW YORK, SATURDAY, MAY 30, 1903. No. 22.

ELECTRICAL WORLD AND ENGINEER

Published weekly by the

McGRAW PUBLISHING CO.

114 LIBERTY STREET, NEW YORK.

TELEPHONE CALL: 7605 CORTLANDT. CABLE ADDRESS: ELECTRICAL, NEW YORK.

EDITED BY T. C. MARTIN AND W. D. WEAVER.

CHICAGO OFFICE - - - - - - 1139 Monadnock Block.
PHILADELPHIA OFFICE - - - - - - 929 Chestnut Street.
EUROPEAN OFFICE Hastings House,, Norfolk St., Strand, London, England.

NOTICE TO READERS WHO ARE NOT SUBSCRIBERS.

The ELECTRICAL WORLD AND ENGINEER is not returnable from the newsdealer. If you desire to purchase the paper from a dealer it will be to your advantage to notify him that you will want it, in order to insure his having a copy for you. If you wish to receive the paper regularly, please send in your subscription so that we can mail it to you direct.

Single copies are 10 cents each. The 52 copies for the entire year cost $3.00 in advance. Please send remittance with your subscription order.

ELECTRICAL WORLD AND ENGINEER.

NOTICE TO ADVERTISERS.

Change in advertisements intended for a particular issue should reach the office of the ELECTRICAL WORLD AND ENGINEER by 10 A. M. MONDAY of the week of issue. New advertisements can be received up to noon of Tuesday of the week of issue.

The first issue of each month is an export issue, having an extraordinarily large foreign circulation in addition to the regular domestic and foreign circulation of this paper.

TERMS OF SUBSCRIPTION.

United States, Canada or Mexico - - - - - - per year, $3.00
Foreign Countries, within the Postal Union - - - - - 6.00
Great Britain and Ireland - - - - - - - - - - 25 shillings
Germany - - - - - - - - - - - - - - 25 marks
France - - - - - - - - - - - - - - 31 francs
Single copies - - - - - - - - - - - - - - .10

Remittances for foreign subscriptions may be made through our European office.
In requesting your address changed give OLD as well as new address.

Copyright, 1902, by McGRAW PUBLISHING CO.

Entered as second-class mail matter at the New York Post Office.

NEW YORK, MAY 30, 1903.

CONTENTS.

Editorial 915
Institute Leaders on the Union Building 918
Philadelphia Meeting of the A. I. E. E. 918
Electricity on the Manhattan 918
The 25,000-volt Transmission Plant of the South Bend Electric Company 919
The Technolexicon of the Society of German Engineers 924
Rankine as a Poet 924
Telephone Meeting of the Chicago Branch A. I. E. E. 925
Western Union and Pennsylvania Railroad 926
Programme of the A. I. E. E. Niagara Meeting 926
Commercialism in Universities 927
Recent Electrochemical Developments. By Clinton Paul Townsend..... 928
New Telephone Patents 928
Municipal Plant Lighting for New York City 930
Meeting of the New York Electrical Society 930
Chicago Convention of the National Electric Light Association 931
Current News and Notes 935
LETTER TO THE EDITORS:
The Mechanical Cause of Gravitation. By Robert Stevenson..... 935
Digest of Current Electrical Literature 936
New Books 939
Weston Employees' Club 940
Ferro-Manganese Plant in Canada 941
Ventilated Cell Diverter 941
Bullock Generators for Massena 941
A New Telephone Receiver 942
Extensive Electrical Equipment for North German Lloyd Docks..... 942
DEPARTMENTS:
Financial Intelligence 943
Commercial Intelligence 944
General News 946
Trade Notes 950
Record of Electrical Patents 951

THE NATIONAL ELECTRIC LIGHT ASSOCIATION.

We have had occasion so frequently during the past several years to refer to meetings and conventions as the "most successful in the history" of the respective organizations considered, that the phrase has become somewhat hackneyed. The present era of prosperity is, however, to be held largely accountable, and this week's Chicago Convention of the National Electric Light Association calls for a repetition of the statement with reference to that body. With an attendance at the end of the first day's session falling little short of 600, a record is made that it will be difficult to surpass. Without doubt this record-breaking attendance was largely due to the great increase of membership during the past year, amounting to no less than 225 per cent. Nevertheless, the present membership of 532 includes but 452 of the 3,800 central stations of the United States, and there is thus left an immense constituency from which to make further additions to the roll. Until Mr. H. L. Doherty inaugurated a new programme of lively solicitation for membership, many of those who had followed closely the life of the Association for the preceding decade yearly felt greater apprehension as to its future. During that period its growth was almost at a standstill while the industry which it assumed to represent was advancing with leaps and bounds. The membership of 150 or less represented few others than the "old timers," and the Association promised soon to be little more than a reminiscent body like that of the "War-Time Telegraphers." Happily, before too late regeneration began, and if the recent pace is kept up, the body will in few years be in every sense what for a time it had only been in name—a national association. The revival in activity has also been evident in the programme of papers of the past two conventions. While the merely perfunctory paper has not been entirely absent, the subjects have with few exceptions been of live, practical interest to the central station man, and treated by engineers and others selected as being thoroughly competent for the tasks assigned. A feature of the greatest importance is the "Question Box," this year greatly enlarged, from which mine of practical information we shall again draw largely in succeeding issues, when also the more important papers will be separately taken up for comment.

THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.

The report of the Board of Directors presented at the recent annual meeting of the American Institute of Electrical Engineers is extremely interesting from its showing of the remarkable advance which during the past year the Institute has made in certain directions. During this period no less than 695 associate members were elected and qualified, and the total membership rose from 1,549 to 2,229, or an increase of 44 per cent. The activity of the Institute is also indicated by the disbursements, which rose to $30,181.25 for the past year, exceeding the disbursements of the previous year by $9,262.61 and those of 1901 by $14,102.35. One of the remarkable developments during the year was in the organization of local branches. Whereas previously Chicago stood alone as a place of meeting outside of New York City, the report shows that during the past year no less than eighteen additional local branches were organized, principally at universities. Among many other new features inaugurated were a grade of membership for students; provision made for selecting and publishing in the *Transactions* theses of graduating electrical students, and the collection and publication of engineering data. President Scott, the chairmen of committees and others who have co-operated with him, are entitled to the highest

credit for a progress made during the past year which stands without parallel in the history of the Institute.

On the other hand, it must be recognized that time alone will determine whether the Institute can in the future successfully accomplish all of the great work that during the past year has been mapped out for it. Bearing in mind the difficulty that in the past has been experienced in Chicago in keeping up interest in the local branch established there some years ago, a great task will be imposed upon the future presidents of the Institute in keeping active life in the numerous branches recently established. While the increase of membership is most gratifying, the accession in great numbers has been so sudden that a doubt arises as to the stability of the present membership list as compared with that of the past—a doubt that will be tested at the first pinch of hard times. Turning to the financial side, we find that notwithstanding the very great increase in the income of the Institute, the balance from the year's operations was only $621.58; and we note furthermore that although the financial statement contains among the assets accounts receivable, there is no entry under liabilities for bills payable, which may imply that instead of a small balance, future payments may actually determine a deficit. Part of the abnormal increase in expenses is to be ascribed to the great expansion of the *Transactions* for 1902, which will be issued in two volumes; the amount expended on this account during the past year was $7,254.16, as against $4,135.62 the previous year, and $2,757.75 in 1901. Similarly, miscellaneous printing and stationery increased from $501.91 in 1901 and $830.24 in 1902 to $2,148.15; postage from $589.20 in 1901 and $797.70 in 1902 to $1,543.50; and salaries from $2,541.64 in 1901 and $4,318 in 1902 to $5,350. In presenting this reverse side of the picture, there is no intention of conveying criticism of the management or of damping ardor in extending along as many lines as practically possible the usefulness of the Institute. The financial showing, however, is a subject for grave concern, not only in view of a possible future contraction of income, but also on account of additional obligation which the Institute may have to assume in connection with the proposed Union Engineering Building.

A NOTABLE SEMI-CENTENNIAL.

Fifty years ago last week may almost be said to have been the birthday of modern American railroading, for on May 17, 1853, the New York Central Railroad was incorporated, and shortly afterward took over the components of the first important railroad consolidation. Prior to that period the traveler from New York westward worked his way up the Hudson by boat or by the Hudson River Railroad, then a powerful independent line, and then headed for Buffalo via a group of ten little roads operated on more or less discordant terms, according to circumstances, and with difficulty managing to shuffle passengers across the State. West of Buffalo the outlook for progress was harder still. It was another and an earlier era in transportation, and it is almost impossible for us now to realize how incomplete and weak were the links that bound together the interests of the continent. Still harder is it to realize that it was fourteen years later before the rail route from New York to Buffalo was under one coherent management. Even then the ways of travel were crude; indeed, the sleeping car was almost an unknown quantity, and the hapless traveler was shuffled from car to car along his devious way in a fashion that would now lead to riot. If the virtues of consolidation are anywhere more conspicuous than in the promotion of through railway traffic, we have yet to find the place. To-day travel is a pleasure instead of a burden, and the coast is nearer than was the Mississippi a generation ago. It is the shrewd and wise enterprise that formed the New York Central which set the pace for future development and has enabled the nation to grow without losing common interests, and to develop a homogeneous whole. No one man or railroad can claim all the credit, but the New York Central has been a road of rare importance in the national growth.

THE TROUBLES OF THE TECHNOLOGICAL HISTORIAN.

A few weeks ago an astonishing and incongruous lawsuit came to a hearing in England, which illustrates how hard it is to write a historical chapter in a technological text-book, and to please everybody, at the same time. Prof. S. P. Thompson's well-known text-book on "Dynamo Electric Machinery" has passed through several editions. In the chapter on the historical development of the dynamo, allusion is made to the fundamental work of Faraday, who was the discoverer of electromagnetic induction, the basis of dynamo action, Faraday having been the first to construct an actual small dynamo, i. e., a magneto-electric machine. Credit is also given to Mr. Henry Wilde for having constructed, in 1866, a dynamo with a separately excited magnetic field. The credit here urbanely offered to Mr. Wilde, F. R. S., does not appear to have been sufficiently luscious and eulogious to satisfy that gentleman, who is reported as bringing an action in Chancery for an injunction restraining the publishers from printing a new edition of Prof. Thompson's "Dynamo Electric Machinery," for the reason that the statements therein, and above referred to, were false; that they constituted libels on the plaintiff, and injured his reputation as a discoverer and inventor. The plaintiff also sought redress in damages and in costs.

If every inventor brought action for injunction for restraint of publishing a book in which the credit to said inventor was deemed by him inadequate, how few historical text-books would be published. The court, in giving judgment, made light of the charge of libel, designating the pleading as pure nonsense. The action was, therefore, dismissed with costs. The new edition of the book will, therefore, be free to go to press with the alleged libel and all. It was really very presumptuous of Faraday to have made a dynamo so early. The plaintiff in this litigation is the same man who, when several years ago awarded a medal by the Society of Arts, "For the discovery and practical demonstration of the indefinite increase of the magnetic and electric forces from quantities indefinitely small"—in other words, for his part in the work in making the dynamo auto-exciting—refused the medal, issued a writ against the printers of the *Journal* of the Society prohibiting the publication of the terms of award, and demanded that they be amended as follows: "For the discovery and practical demonstration of the indefinite increase of the magnetic and electric forces from quantities indefinitely small—his invention of the dynamo-electric machine, founded on this discovery, and its application by him to the production of the electric searchlight and to the electro-deposition of metals from their solutions." Surely, the fool-killer of the British Isles has been neglecting his work.

RECENT ELECTRICAL DESIGN.

A paper by Mr. W. B. Esson in the last number of the *Transactions* of the British Institution of Electrical Engineers, entitled, "Notes of Recent Electrical Design," gives a general view of the various types of dynamo-electric machines in modern use. It is remarkable to contrast the recent conditions in dynamo machinery with those existing say twelve or fifteen years ago. At that time a large variety of types existed, with very different shapes, dispositions and magnetic circuits. Each inventor or designer claimed some special advantage for his own particular type of dynamo. At the

present time, however, there are only a few types surviving, although the number of dynamos in use is constantly on the increase. There are, moreover, but few differences between American and European types of modern dynamos. Of course, there is a marked difference between the styles of different countries manufacturing one and the same type. It is not difficult to distinguish between a German, an English, a French or an American machine by its style; but the structural type may be essentially the same.

In Europe the armatures are commonly tunnelled, and in America slotted. That is to say, the conductors of European machines are commonly threaded through holes or tunnels provided in the armatures parallel to the axis and close beneath the surface; whereas in American machines, the conductors are usually in form-wound coils laid into slots or grooves in the surface of the armature. Even this difference has, of recent years, been minimized by the custom of slitting open the tops of the tunnels in the European machines, so as to transform them into slots of an overarched form. Mr. Esson points out that British alternator designs tended until recently to make the machines unduly heavy for their output, through aiming at an inherent regulation of 2 or 3 per cent. The customary regulation in this country and on the European continent has been from 5 to 7 per cent., on the basis of full non-inductive load. The paper points out that a great saving in material is effected by coming down from an unduly high capability for inherent regulation, and adopting 5 or 6 per cent. for a power factor of unity and also 30 or 35 per cent. for a power factor of zero. The additional specification in this way, of the regulation for zero power factor is quite a good innovation, and might well be adopted. From these two data, the regulation at any intermediate power factor may be closely approximated to by a very simple formulas.

In regard to polyphase transformers, there is a distinct divergence between American and European practice. With us, two small single-phase transformers are used, in association, to give step-down three-phase consumption currents. When the load is sufficiently great, three single-phase transformers are used, one on each side of the three-phase triangle. In Europe, however, three-phase transformers are the almost invariable rule, the magnetic circuit being triple, and the fluxes in triphase relation, so that the secondary coils on the same transformer generate three-phase electromotive forces. It is difficult to see why this plan has not been more generally adopted with us. The usual defense for single-phase transformers is that they are simpler, and that if any accident happens to them, it is usually to but one of three, whereby the service may be temporarily maintained by the other two. But we may expect to see the three-phase transformer eventually take its place in American installations, since there is a saving in material and an improvement in regulation consequent upon its use.

THE SOURCE OF ACTIVITY IN RADIUM.

It was mentioned by Mr. W. J. Hammer in his recent paper, before the American Institute of Electrical Engineers, on "Radium and Other Radio-Active Substances," that Lord Kelvin had been quoted to the effect that the discovery of Becquerel radiations had placed the first question mark against the principle of the conservation of energy since the principle had been enunciated. In a recent number of *Nature* (April 30th), Prof. J. J. Thomson discusses the cause of the remarkable activity of radium. It is well known that the samples of radium and radium salts recently produced are self-luminous, and are radio-active. Moreover, it is now stated that a sample of radium enclosed in a block of ice, melts the ice in its immediate neighborhood at a rate of about its own weight in two hours, representing a very appreciable liberation of energy. Since it takes nearly 80 gramme-calories, or 335 joules to melt a gramme of ice, one gramme of radium, according to the preceding statement, liberates 167.5 joules per hour, or 465,000 ergs per second (0.0465 watt).

Prof. Thomson points out that much discussion has arisen over the source of this power. Some have suggested that radium had the power of absorbing and redistributing radiation energy derived from without, as for example, when the sun's rays falling upon a pebble immured in a block of ice, warm the pebble and enable it to melt the ice in its immediate vicinity. There is, however, no evidence in this case of power of such magnitude reaching the radium from without. The article points out that the facts are in conformity with the hypothesis that a few of the atoms of the substance attain a condition of instability wherein they disrupt and liberate energy in transformation to a new condition of stability in which the intrinsic energy is much smaller. A gramme of carbon will liberate about 3.4×10^{11} ergs when combining with oxygen to form carbonic acid. On the supposition that the carbon and the oxygen each contribute half of this enregy, the carbon gramme may be credited with 1.7×10^{11} ergs to expend. It could keep up an expenditure of 465,000 ergs per second, radium's alleged activity, for 3.66×10^5 seconds, or 4.25 days. But the carbonic acid formed may still possess a relatively large quantity of intrinsic energy, although not in an available condition for recovery, so that this may be but a small part of the total intrinsic energy of carbon.

According to the data assumed by Thomson for the constituent charges or ionic charges in the radium atoms, their disruption would supply the observed amount of power for 30,000 years before the internal energy was all exhausted. This indicates how much energy may be stored away in matter, and the possibility that at some future time the discovery may be made of a process for extracting some of this energy by bringing substances into a condition at which the energy may be readily delivered. The process of combustion is really a particular method of effecting this result thermodynamically. Two kinds of matter, each in stable atomic equilibrium, are brought into contact under suitable conditions whereby they change their atomic conditions, and evolve a certain portion of their original intrinsic energy. It does not necessarily follow, however, that this is the only means that the range of natural law will permit for squeezing the internal energy out of atoms. It is quite conceivable, even though it should never be realizable, that matter might be brought by definite physical processes to a condition of instability with the absorption of but a small amount of energy, and that it would then automatically collapse into a new atomic structure in which the intrinsic energy was much lower. The excess of the original intrinsic energy over that required for the new condition, should then be liberated in some form, say, either as heat in a furnace, or electrically in some voltaic combination.

This speculation is fostered by the seeming facts concerning radium, wherein, if Thomson's theory is correct, the radio-activity of one atom of the substance excites neighboring atoms to the limits of instability. Here, then, is a substance which at ordinary temperature and pressures, breaks down atomically with the liberation of radiation and ultimate thermal energy. The great difficulty is, of course, that any useful substance for yielding internal energy, must be cheap, and must take but little energy inpact to bring it to the unstable state. Such substances, nearly unstable of their own accord, are not likely to be plentifully distributed in Nature.

Institute Leaders on the Union Building.

As was noted briefly in these pages last week, a number of interesting letters were presented at the annual meeting of the American Institute of Electrical Engineers, applauding the Carnegie gift of one million dollars for a union engineering building and urging the Institute to do its share in making the opportunity productive of good. Mr. T. A. Edison, for example, addressing President Scott, said:

"I am delighted to note the sequel of the Institute library dinner which I had the pleasure of attending last February and am heartily glad to be able to congratulate you on the generous gift of Mr. Carnegie of one million dollars to the Institute and its sister societies. I have the greater pleasure, in this benefaction to the society, because it comes from one of ourselves, who began at the key and has shown himself so worthy of the great wealth that has come to him since he was a humble telegrapher. I am convinced that all the societies concerned will feel it their duty to unite in the disposing of this gift so as to render it of the utmost value and profit to the professions they represent and to the arts and sciences in general."

Dr. A. E. Kennelly, past president, in his letter, remarked: "It seems to me that no more valuable endowment could be made for engineering than that which will harmonize and unite the various engineering societies, bringing these bodies into one building, and building them into one body. It would bring into closer co-operation the branches of that guild whose past industry has made possible the greater co-operation and the grandest civilization that the world has already won. I regard it not merely as a lasting benefit to engineers, but also through their labors, and the work that they will carry on in the union Engineering Building, as a distinct gain to all the nations of the world."

Mr. Carl Hering, past president, said: "Those of our members whose fortunes have been made in the electrical industry and profession now have an opportunity to follow the generous example set to Mr. Carnegie by recognizing in a substantial way the institution which has been such a potent factor in the marvellous development of an industry which has brought fortunes to many. This Institute is now recognized to be of national importance, and during the past few years its reputation and standing is beginning to be recognized abroad. It has no rival in its branch of engineering in this country. National questions are referred to it and its opinion on international matters is respected. Although the youngest of the national engineering societies, it has been the most active in the efforts to realize that long-cherished dream of so many engineers, a Union Engineering Building in the Metropolis of our country. We should, therefore, not be the last to assure Mr. Carnegie that he has not overestimated our abilities to maintain the magnificent home which he has so generously offered us."

Prof. W. A. Anthony, past president, said: "I have felt the keenest interest in its work, and I know that the papers that have been read and the discussions that have followed upon various subjects have helped very greatly to advance the interests of the electrical art, and if a building can be secured where the Institute can have permanent quarters in connection with the other engineering societies I am sure it will increase greatly the efficiency, not only of its work, but of that of the other societies also."

Mr. Frank J. Sprague accompanied his donation of $2,000 with an admirable letter in which he said: "While it is perhaps natural that such a building shall have as its principal attraction the technical libraries of the different societies, which should, under suitable restrictions, be accessible to all members, it would seem proper that it might also have in its equipment as a source of inspiration and instruction, a collection of models of the original apparatus illustrative of important departures in engineering practices. As a member and a past president of the Institute, I am in hearty accord with the general plan which has been proposed for a building to be occupied as a common home, and I will gladly bear some portion of the burden which will fall upon our particular Institute."

Prof. Elihu Thomson, past president, sending $5,000 to the endowment fund, said: "It is not conceivable that any member can fail to be deeply interested in the new possibilities and opportunities which arise out of the munificent offer of Mr. Carnegie. By his most generous gift he has shown his own deep interest in the work and in the future co-operation of our chief engineering bodies. The membership of those bodies now have the duty of seeing to it that the gift is largely used and in a way to redound forever to the credit of American engineers. There is no need to dwell upon the importance of the work of our Institute in the past. Who can doubt that with the enormously enlarged opportunities now to be afforded that there will be a great extension of its usefulness in the future?"

Mr. J. G. White has given $1,000 flat and $1,500 conditional. He made the motion which committed the Institute to the plan, and said: "I should like to see the entire amount to be supplied by the Institute provided by subscriptions and contributions and not by mortgage on the land. I understand it was at first suggested that the money might be secured in this way. It seems to me it is possible to secure sufficient funds to pay for our proportion of the necessary land without reference to a mortgage loan. With contributions from the Westinghouse Company, the General Electric Company and others who will undoubtedly contribute, and also from Prof. Thomson and the other members of the Institute, it ought to be quite possible for us to provide our portion of the amount. If that is not done, it seems to me we might go to what would be the next best position—if we cannot get the full amount at once, get in position where we could gradually go ahead without a jar, and that would be to have a sinking fund, instead of a long-time loan, have bonds in a sinking fund which would gradually retire the ownership, so that ultimately your proportion of the land will be paid. I hope the effort to secure the entire amount by subscription and contribution will be first made, and I believe it is quite possible to do it."

Philadelphia Meeting of the A. I. E. E.

The regular meeting of the Philadelphia Branch of the American Institute of Electrical Engineers was held on Monday evening, May 11, at the Engineers' Club, of Philadelphia. The chairman, Mr. Carl Hering, in an opening address, gave details of Mr. Carnegie's offer for the Union Engineering Building, his remarks on the subject being enthusiastically received by the members.

Mr. Philip Torchio, of the New York Edison Company, was present, and presented, with some addition, the paper on "Safety Devices in Central Stations and Sub-Stations," which he had read at the New York meeting. Mr. H. A. Foster gave an abstract of the paper presented by Mr. H. A. Lardner at the New York meeting, entitled, "Economical and Safe Limits in the Size of Central Stations." Mr. J. T. Hutchings, of the Philadelphia Edison Company, gave an abstract of the paper Mr. Peter Junkersfeld presented at the New York meeting, on "Multiple Versus Independent Operation of Units and Central Stations." Mr. A. R. Cheyney, of the Philadelphia Electric Company, presented a concise abstract of the discussion held in New York on the three papers.

The general discussion was participated in by Messrs. W. C. L. Eglin, Horatio A. Foster, Carl Hering, Philip Torchio, Paul Spencer and J. T. Hutchings. The meeting was well attended, and about fifteen members were present at the informal dinner at Boothby's restaurant, before the meeting.

Electricity on the Manhattan.

The statement of the Manhattan Railway Company to the State Railroad Commission for the quarter and the nine months ended on March 31 shows that the total number of passengers carried in the first three months of this year was 65,193,975, which compares with 58,037,249 in the corresponding period of 1902, and 50,448,918 in the same period of 1901. For the nine months the total number of passengers carried was 180,481,586, an increase of 22,921,489 compared with the nine months ended March 31, 1902.

The gross earnings for the quarter showed an increase of $351,828, with an increase in operating expenses of only $63,750. This was construed in Wall Street yesterday as an indication of the economical working of the third-rail system. For the nine months the gross earnings showed an increase of $1,127,888, with an increase in operating expenses of only $41,225.

The elevated railroads of Manhattan are now maintaining a service representing 165,000 car miles a day on 110 miles of track, which is more than equivalent to a service of 400 cars a day between New York and Pittsburg.

The number of persons carried daily by the elevated trains now averages about 800,000. They travel on the average about four miles, so that the average fare is about 1 cent a mile. The electrical horse-power used in train movement is about 45,000, continuously exerted.

The 25,000-Volt Transmission Plant of the South Bend Electric Company.

A HIGH-TENSION power-transmission installation for supplying current to the system of the South Bend Electric Company, has just been put in operation by that company. The plant is situated at Buchanan, Mich., on the St. Joseph River, about 16 miles north of South Bend, Ind. This is a typical installation, exemplifying up-to-date practice in hydraulic and electrical engineering. It is not the purpose of this article to discuss the value of such an installation, when operated in connection with a steam plant, from an economic standpoint, but rather to call attention to the flexibility and the readiness with such a combination lends itself to any and all conditions which arise in the operation of an electric light and power system.

A large part of the current will be used for supplying the system of the company at South Bend and that at Buchanan. There is a municipal plant at Niles, about five miles south of the former place, and as this is in need of additional power, it is quite likely that this will become a consumer. There is a possibility of the lines being extended to St. Joseph and to Benton Harbor, Mich., about 25 miles distant, should the demand at those places warrant it. As the Indiana Railway Company's line now building from South Bend to Niles parallels the high-tension transmission lines between those two points, the operation of that part of the road by rotary converter sub-stations with current supplied from the transmission lines, is being considered.

The South Bend Electric Company is engaged in the usual lighting and power business in the city of South Bend, and also operates a small system recently acquired in Buchanan. The company was incorporated in 1884, and began business with six series arcs. Since then the business has grown to such an extent that some 1,800 customers are supplied at the present time. About 15,000 16-cp incandescents are connected to the system, as well as 460 Adams-Bagnall constant-potential enclosed arc lamps. The motors, some 125 in number, are mostly 500-volt, and range from 2½ to 60-hp. The company does the city lighting, for which 407 arcs, nearly all of the open series direct-current type, are used.

The accounting system conforms as nearly as possible to that recommended by the National Electric Light Association, and the office methods employed are up-to-date in every respect. As arc lights and incandescent lamps are connected to the same meter, a uniform charge of 15 cents per kw-hour is made, and in case of payment before the 10th of the month, a discount is allowed, depending upon the gross amount of the bill. A minimum of $1 a month is charged for residence lighting and also for store lighting, but in the latter case a minimum charge of 15 cents per outlet is made when these exceed seven in number. Power is charged for at the rate of 10 cents per kw-hour, with a discount depending upon the gross amount of the bill, and the minimum charge is based on the size of the motor installed. The city pays at the rate of $62.50 and $90 for each arc for midnight and all-night service respectively. In case of the non-payment of a bill within a reasonable length of time, it has been found that an immediate cut-off has led to prompt collections, which furthermore have been prompted by the fact that a fee of $1 is charged for each reconnection to the system. The business has enjoyed a healthy growth in the last few years, and is in a very good condition at the present moment.

A small electric light plant which was installed at Buchanan, Mich., some years ago, has been acquired, and will be run from the hydraulic plant at that place. An office is located there to take care of the local business, although of course all the accounting, system of charges, etc., conforms to that employed at South Bend. There are 36 city arcs, a number of commercial arcs, and about 1,100 incandescent lamps connected with this system; likewise several motors, the largest of which is a 3-phase, 50-hp induction, used for driving a brickyard. At the present time the motors are operated from a separate circuit, but later on it is proposed to use the 3-phase circuit for all purposes, the lighting transformers being, of course, single-phase. The old plant, which was built about 1893, contains three 48-in. water wheels, a small Westinghouse automatic engine which ran the plant during the construction of the new one, and several small generators, and will be dismantled as soon as the circuits can be operated from the new plant. Although the amount of the business at Buchanan is not very large, it is an important link in such a combination.

FIG. 1.—VIEW OF POWER HOUSE. OLD POWER HOUSE IN BACKGROUND.

The steam power house at South Bend, since the completion of the hydraulic plant at Buchanan, is used as a sub-station and distributing point merely. The steam plant is operated only at such times as is required because of interruption in the power supply from the latter point, or in case the load at South Bend becomes such that it cannot be taken care of from Buchanan, which it is expected will happen only in case of extreme low water or at times of a heavy peak. The physical plant of the company at South Bend is that usually met with in steam stations of such a size. This is true not only as regards the power house proper, but also as regards the other departments which necessarily are required for the successful operation of a central station. It is not necessary, therefore, to enlarge upon these, except to call attention to the methods and apparatus used.

Two 500-volt power circuits are in use in the down-town districts. All elevators which are especially objectionable to the regulation of any system, are connected to these and such other motors as are located in that district. It is the intention of the company to connect all elevator motors to these circuits in the future, but all growth in the motor business will be taken care of by means of a 3-phase circuit supplied from the same buses as the lighting circuits. The lighting circuits, three in number, are single-phase, but operated from the 3-phase bus, potential regulators being installed in each circuit for regulating purposes. Thomson recording wattmeters and Westinghouse single-phase meters are used extensively on the circuits. The transformers, however, are of several makes, although these are being standardized as much as possible. Because of the scattered lighting, it has not been possible to introduce 3-wire secondary circuits to as great an extent as is the case in some other cities. The series direct-current arcs for store lighting have been entirely superseded by constant-potential lamps on the lighting circuits, but the former are still used for the city lighting. The latest methods and apparatus are being introduced as fast as conditions warrant such a course.

It may not be amiss to call attention to the various features embodied in the design of the steam plant, which was erected in 1891. means of a 3-phase motor, which is installed in such a manner that its armature shaft forms part of the main line of the jack shafting.

The electrical equipment of the steam plant includes a 600-kw Westinghouse single-phase alternator installed on the jack shafting as already mentioned. This has recently been changed such that it can be operated either as a 3-phase generator or as a 3-phase synchronous motor. This was necessary, as in changing over to an electrically operated sub-station, it of course was essential to provide the means for operating the jack shafting formerly driven by the steam engines. A convenient and at the same flexible arrangement was secured as a result of the change. Under existing conditions the steam plant can be operated as formerly, and the 3-phase generator thrown in parallel with the buses energized from the Buchanan plant, or this machine can be operated separately and loaded with such circuits as may be desired. This can be readily accomplished, as there are two sets of 2,300-volt buses, and each circuit and generator is supplied with two oil switches, which are distinguished by the color of the handles. The other link between these two systems is a 300-kw, 60-cycle rotary-converter, which, through a coupling on its extended shaft, can be driven from the line shaft. By energizing the shunt field on this machine, which on the direct-current side delivers current at 500 volts, it can be operated as a 3-phase gen-

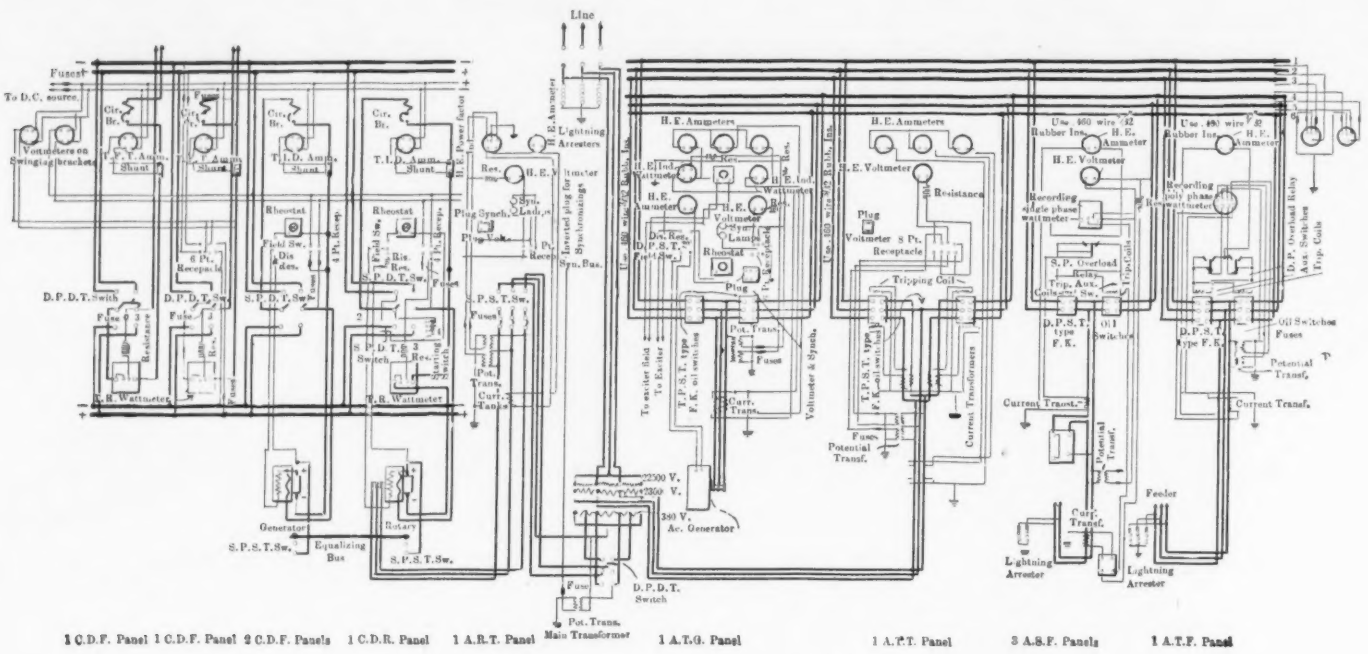


FIG. 2.—WIRING DIAGRAM OF SOUTH BEND STATION.

Although this is used as a sub-station now, it was in operation until a very short time ago, and is of good construction throughout. An anomaly which is rather striking is the fact that although the plant is located on a branch of the St. Joseph River, thus having a constant and ample supply of water, all of the boiler feed and the larger amount of the water used for condensing purposes, is taken from two 8-in. artesian wells.

The boiler house contains the usual equipment of boilers and other apparatus to be found in such a plant. There are three 250-hp vertical and one 200-hp horizontal Wickes water tube boilers, and one 250-hp Babcock & Wilcox boiler, all of which are equipped with Wickes shaking grates. There are two guyed steel stacks, one 150 ft. high and 75 in. in diameter, and one 137½ ft. high and 37 in. in diameter. One duplex Blake, one single-cylinder Knowles and one duplex Snow pump supply the necessary boiler feed, which passes through an open heater of home make, before entering the boilers. Steam is generated at 125 pounds, and is supplied by means of steam piping underneath the floor to three engines, of which two are Cooper-Corliss cross-compound, 22 and 36 x 48, and one is a Noye tandem-compound, 21 and 38 x 36. Jet condensers are used, of which one is a 1,000-hp Worthington steam-driven, and two are of Cooper make of 500 hp each, and are driven from the crank shafts of the engines. The condensing water for one of the Cooper engines and the Noye, is taken from the wells, whereas that for the other is taken from the river. A jack shaft extends the entire length of the power house, and can be separated into units by means of clutches. This can be driven by the three engines mentioned, or by erator, which was the case before the plant in Buchanan was started, as at that time the generators installed in the South Bend plant were not of a large enough capacity. The rotary, when operated from the direct-current side, will deliver 3-phase, 60-cycle alternating currents at a potential of 333 volts. This in the transformers is then stepped up to 2,300 volts, and at this potential can be used for the alternating-current distribution. The purpose for which it will be ordinarily used, however, is to furnish 500-volt direct current for the power circuits, although this can also be accomplished by running the large 3-phase motor connected to the line shafting, and in turn the 500-volt direct-current generators. Usually the high-potential current when stepped down will be delivered directly to the 2,300-volt, 3-phase buses, from which the circuits will take their supply.

The electrical equipment of the steam plant includes, in addition to the altered 600-kw single-phase alternator and the 300-kw rotary-converter already mentioned, one 150-kw, 2,300-volt Westinghouse single-phase alternator and one 100-kw and one 150-kw, 500-volt General Electric direct-current generators. Four 100-light, 9.6-amp. Western Electric and two 125-light, 9.6-amp. Brush direct-current series arc machines are used for the city lighting. For the arc circuits the old switchboard is used, whereas the new board recently installed, is used for all other circuits.

As at present no switching whatever is done on the high-tension side of the transmission line, it has not been necessary to provide any switchboard facilities for that purpose, and as a consequence the apparatus installed at South Bend is quite simple. Where the high-tension line enters the building, long, heavy porcelain tubes are

used, which in turn are supported in the centers of two hard maple discs placed in the ends of a large sewer crock built into the wall of the building. After passing an ordinary air-break, knifeblade switch, the lines pass to the step-down transformers. A multiple-unit lightning arrester connected to the line on the station side of the switch, is thoroughly grounded by a copper plate buried in the subsoil. The air-break switch is used merely to open the circuit after the line is dead. Three 500-kw General Electric step-down transformers of the oil-insulated, water-cooled type are used, with a primary winding for a voltage of 24,500 D or 42,500 Y, and 360 and 2,300 volts secondary. The transformers are connected with the switchboard by means of lead-covered, rubber-insulated cables. A small 5 x 5 single-cylinder, double-acting pump, drive nby a 1-hp General Electric, 3-phase induction motor, supplies the cooling water for the transformers from the artesian wells. The 360-volt secondary taps are, of course, brought out for the rotary-converter, which as a consequence can by means of the step-up transformers, deliver 2,300-volt current to the buses of the switchboard. The 2,300-volt leads from the step-down transformers are taken to a transformer panel on the switchboard, which will be described in connection with the latter.

A modern marble switchboard of General Electric make, as will be seen by the photograph, has been installed at the South Bend plant.

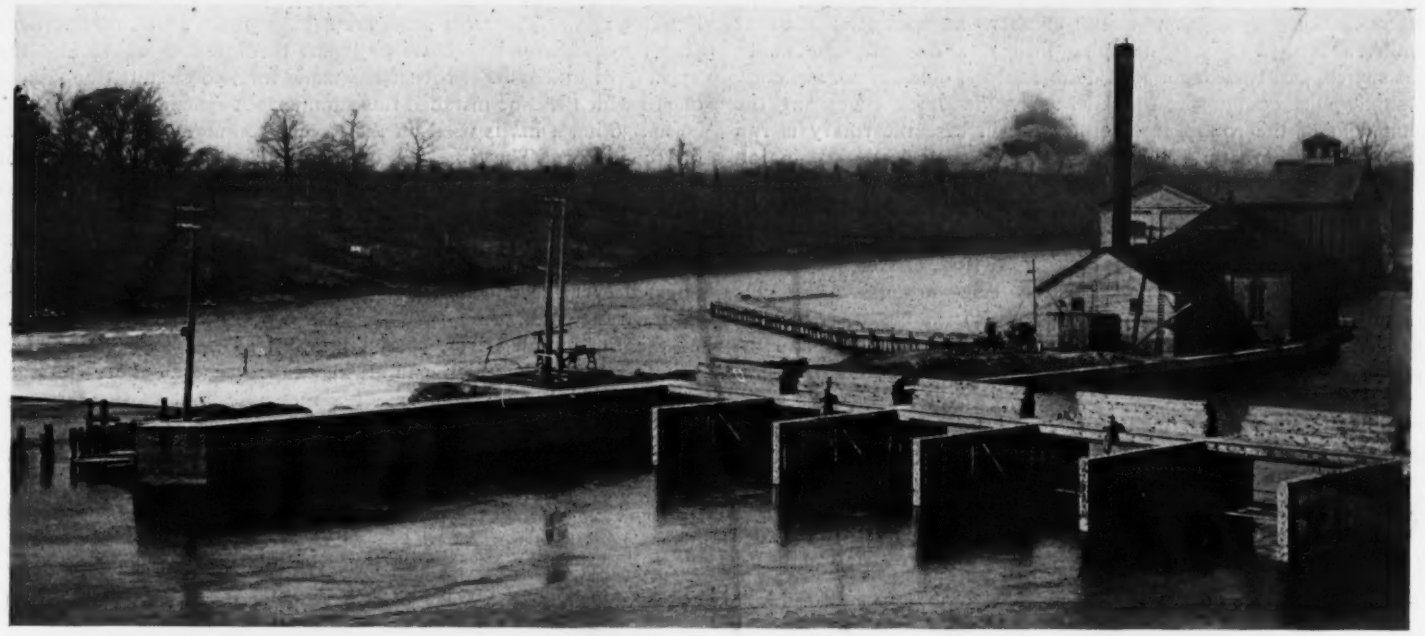


FIG. 3.—BUCHANAN POWER HOUSE ON THE ST. JOSEPH RIVER.

This consists of the various panels required by the different apparatus installed, and contains the necessary instruments, switches, etc. Proceeding from right to left as one faces the board, the first two panels are devoted to the 500-volt circuits. Two voltmeters, one for each of the two panels, are provided on swinging brackets at the side. Two sets of buses are installed for the 500-volt generators and circuits, so that the former can be thrown in parallel or used separately, or any other combination that may be desired, secured. Each circuit is provided with a single-pole circuit-breaker, an ammeter for indicating the load on the circuit, a double-pole, double-throw, quick-break switch, so that the circuits can be thrown on either one of the two buses, and a Thomson integrating wattmeter.

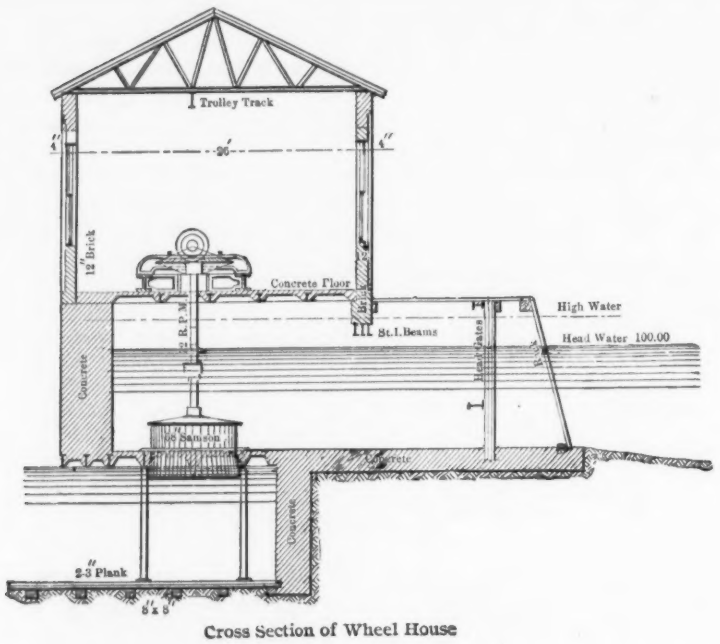
The two 500-volt panels contain, in addition to the circuit-breaker

FIG. 4.—INTERIOR OF BUCHANAN POWER HOUSE.

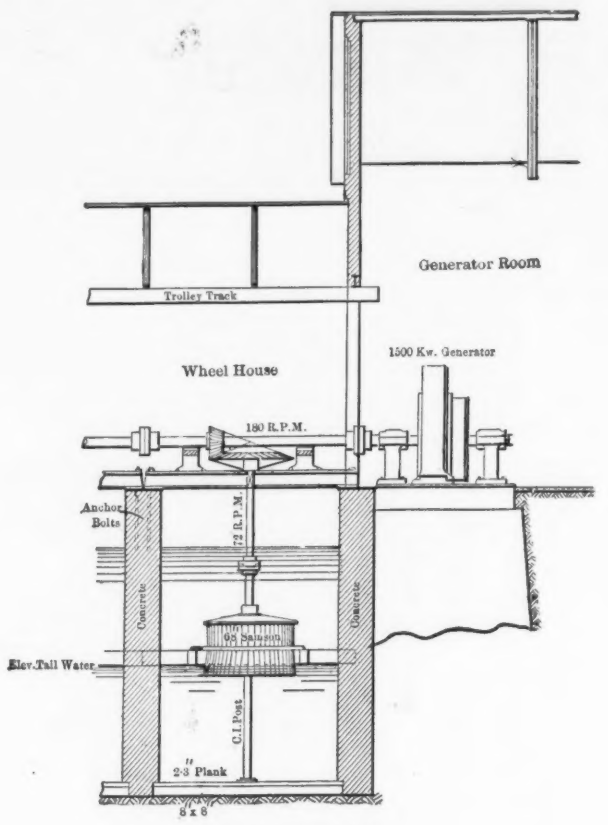
and ammeter, a single-pole discharge resistance field switch, rheostat handle, a potential plug switch, two single-pole, double-throw, quick-break knife switches for throwing the generators on either of the two buses. On the lower left-hand panel will be noticed two single-pole, single-throw equalizer switches.

The panel devoted to the direct-current side of the rotary converter contains a 500-volt circuit-breaker, an ammeter, rheostat handle, a four-point potential plug switch, a discharge resistance field switch, and two single-pole, double-throw, quick-break switches. A single-pole, double-throw switch is provided for energizing the shunt field of the rotary from either bus in case the rotary is run as a 3-phase alternator. The alternating-current panel contains an ammeter, power factor indicator, a synchronizing voltmeter and lamp, and three single-pole, single-throw quick-break switches. The starting panel of the rotary is located at the machine, and contains a 500-amp., double-pole, double-throw switch. The machine is started on 144 volts, the transformer taps being brought out in such a manner as will be seen from the diagram of the board, as to form an open delta, whereas when running, the delta is closed and the voltage is increased to 360.

One panel is provided for operating the 3-phase motors. This contains three ammeters, one in each leg of the circuit, two indicating wattmeters, a synchronizing voltmeter and lamps, a potential plug switch, an ammeter for the exciter circuit, a double-pole, single-throw, discharge resistance field switch, and two automatic oil switches. Two sets of bus-bars extend back of this, the transformer and the circuit panels, so that any desired arrangement can be secured.



Cross Section of Wheel House



Longitudinal Section

FIG. 5.—LONGITUDINAL AND CROSS SECTIONS OF BUCHANAN POWER HOUSE.

The 2,300-volt low-tension currents only are brought to the switchboard from the transformers, and the panel devoted to these contains three ammeters, a voltmeter and a potential plug switch. Two automatic oil switches are provided for the necessary switching.

Three single-phase circuit panels are each provided with two ammeters, one potential regulator and two 2,300-volt triple-pole single-throw oil switches, interlocked on the back of the panel and provided with overload relay. An induction meter on the back of each panel measures the output of the circuits. The three-phase motor panel contains an ammeter and two oil switches, also a 3-phase integrating wattmeter on the back of the panel. Two 3-phase static ground detectors connected to the two sets of buses are mounted on a swinging bracket at the end of the board. Thomson horizontal edgewise instruments are used exclusively.

The transmission line, except where it crosses the St. Joseph River, presents no unusual features, a standard construction having been adopted. No. 0 soft-drawn bare copper is used, the size obviating a large loss in transmission. In the city of South Bend 60-ft. Idaho poles are used. Further out, where the line passes Notre Dame University, this has been decreased to 55, and the rest of the way to Buchanan the poles are 40 ft. in length, but of Michigan cedar. In the city especial precautions have been taken to build a very substantial line, double cross arms being used whenever the line crosses telephone or other leads. A spacing of 100 ft. is used. Very sharp corners are avoided, and whenever a turn is made this is well-guyed. The cross arms are 4 in. x 5 in. in size, of Southern pine covered with two coats of paint, the lower being 10 and the upper 7 ft. in length. Provision is made for two circuits, the second one of which will be installed this summer. A spacing of 4 in., 36 in., 40 in., 36 in., 4 in., is used on the lower arm, and 4 in., 76 in., 4 in. on the upper. The pins are of locust boiled in paraffine and of special design. Locke insulators are being used, tested to 80,000 volts at the factory. The wires form an equilateral triangle with the apex at the upper end, each side of the triangle being 36 in. long. Three complete transpositions are made in 18 miles, a partial one being effected every second mile. A private telephone line is also carried on the same poles. As a span of 750 ft. is necessitated by the crossing of the St. Joseph River, special precautions had to be taken, and this is accomplished in the following way: At each shore end four poles are erected in the form of a rectangle, and these are guyed back to the pole line. A ½-in. stranded galvanized iron cable is used as a messenger wire, from which three insulators are suspended in their usual vertical position. To the pin, however, is fastened an eye-bolt, which supports the copper line wire.

The development at Buchanan dates from the fall of 1901, when work was commenced on the new power house. The old water power plant which was used for lighting the city of Buchanan, was purchased in 1900, and the water rights secured for a distance of ten miles to Berrien Springs. The dam is located about a mile from the village on the St. Joseph River. It is estimated that this will furnish a minimum of 2,000 hp for from four to six weeks in a year, while the maximum will reach the 5,000-hp mark. On an average 2,500 hp is available for about three months and 4,000 hp for the remainder of the year. At present one 1,500-kw generator is installed, but work will be commenced this summer to double the size and capacity of the power house.

The dam in use was constructed eight years ago. This is of the gravity type, built of wood with two rows of sheet piling below and one above it. The dam is about 400 ft. long, and a short distance

above the new power house, which is 215 ft. long and 40 ft. wide. The latter is built of stone and iron with concrete foundations, and has a slate roof. It parallels the river, so that the water from the turbines is discharged directly. The head race is short, and as it was cut through a bank of gravel of excellent quality it is lined with a concrete wall on the river side only, which extends from the regulating gates to the power house proper. At the former, both banks of the head race are lined with concrete walls, as well as the bottom at that point. The regulating gates are seven in number, and are operated by racks and pinions.

Because of the low head of water, which averages about 10 ft., comparatively small units in water wheels have been installed. There are ten 68-in. Leffel water wheels of 300 hp each. These are of the vertical type, and are geared to a line shaft which extends nearly the entire length of the building, and to the end of which the generator is coupled. A small vertical 40-in. Leffel wheel is used for driving the exciter, which is belted to an intermediate shaft, driven by gears. The line shaft is divided into three units such that either four, seven or ten wheels can be used for operating the generator, depending upon the load carried. In addition, the gears on the line shaft can be thrown out of mesh, so that any water wheel can be repaired if

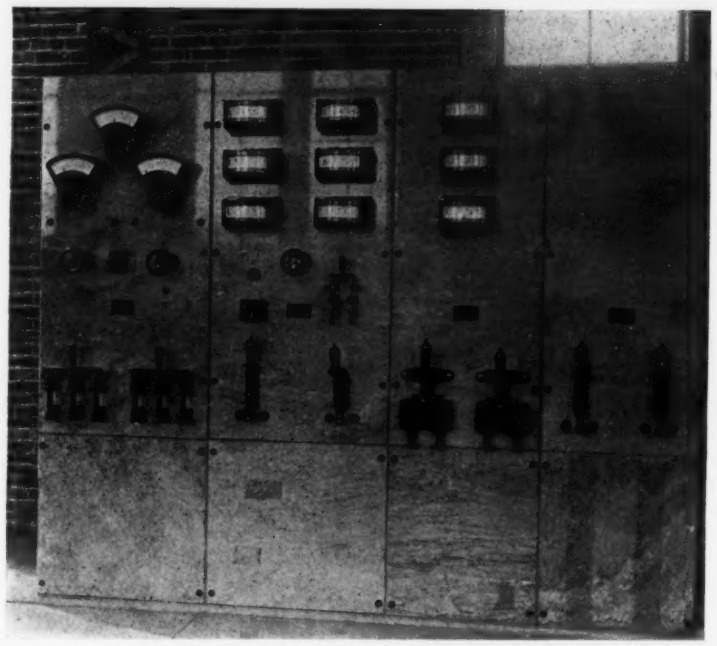


FIG. 6.—EXCITER SWITCHBOARD, BUCHANAN POWER HOUSE.

necessary. Two Lombard water wheel governors are installed for regulating purposes, being driven from the line shaft. The special work required for the line shaft and turbines can be clearly seen in the view. A 20-ton hand-operated Whiting Foundry Company's crane, which serves all the apparatus in the building, can also be seen.

A 1,500-kw, 60-cycle General Electric revolving field type alternator is installed and supplied 3-phase current at a pressure of 2,300 volts, which is conducted to the generator panel of the switchboard by means of lead-covered, rubber-insulated cables. The exciter is a 60-kw, 125-volt direct-current generator. The switchboard, as well as the step-up transformers, are located in one end of the building near the generator which, when the other half is added, will be the middle portion of the completed structure. The switchboard at Buchanan was installed some time before that at South Bend, and as planned at that time, contemplated the installation of switches both on the high and low-tension side of the step-up transformers. It was the intention to instal two sets of switches, so that as finally constructed either generator could be connected with either set of transformers, and the same could be done with the transmission lines. However, this idea has been only partially carried out, the high-tension switches not being used at present, though installed. As a consequence, the switching operations are all performed on the low-tension side of the transformers. It will be noted that the step-up transformers are not provided with any special leads, inasmuch as no rotary-converter or similar apparatus requiring an alternating current of lower potential than that of the generator, is installed in the power house. The transformers are of the same size and type as those installed at South Bend, but the voltage is as follows: Primary, 25,300 △, or 43,800 Y, and 2,300 volts secondary. A 5 x 7 single-acting Gould pump driven by belt from the main line shaft,

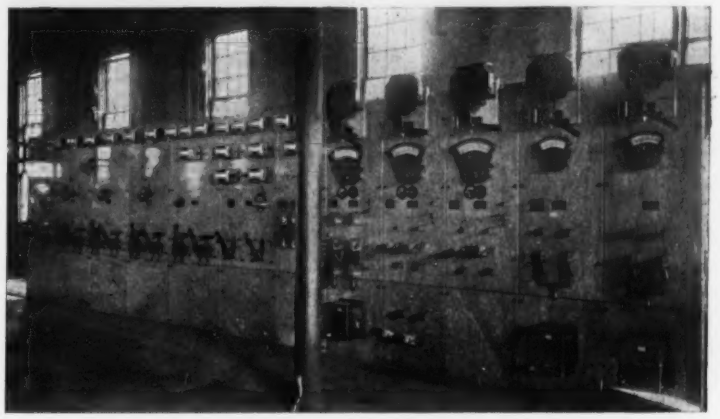


FIG. 7.—SWITCHBOARD SOUTH BEND SUB-STATION.

supplies the water for the transformers from the river. The high-tension lines are taken to the transformers and protected in the same way as at the other end of the line.

The switchboard consists of one exciter panel, one generator panel, two low-tension transformer panels, one of which is not in use, and one high-tension line panel, which also is not used. This board contains the same instruments, switches, etc., as the corresponding panels at South Bend, and as a consequence it is not necessary to enumerate them.

From an operating point of view, the system is seen to be very flexible, and lends itself readily to any and all conditions which may arise in the operation of the system at any point. At the time of the writer's visit, trouble had occurred on the transmission line, and for that reason it had been necessary to start up the steam plant. As this is always kept in such shape as to be put in operation at a moment's notice, no serious interruption to the service was experienced. Neither was there any delay in starting up the station, enough men from the other departments being used to complete the force, a chief engineer and two assistant engineers being permanently employd. As this article has been confined to a description of the engineering features and operating conditions of the system, it is not the intention here to discuss the economic value of the same.

In conclusion it may be said that Messrs. O'Keefe and Orbison, of Appleton, Wis., were the consulting hydraulic engineers, and Mr. George M. Brill, of Chicago, the consulting electrical engineer, no

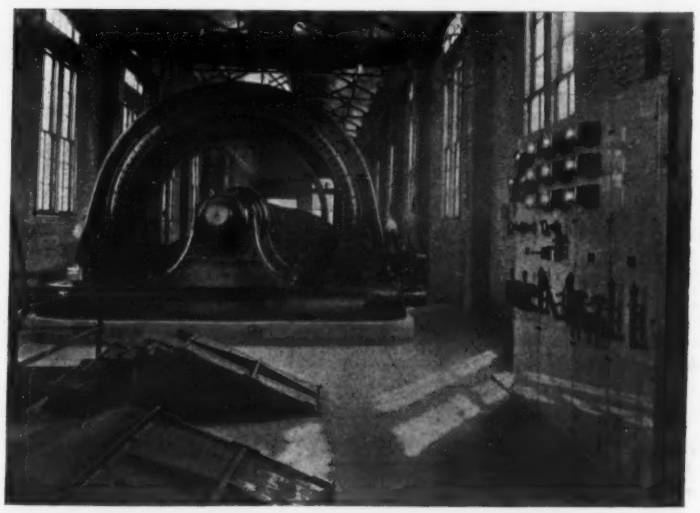


FIG. 8.—2,500-KW GENERATOR AND EXCITER SWITCHBOARD.

little credit being due to these for carrying out the work. Mr. Charles A. Chapin is the principal owner of the South Bend Electric Company, of which Mr. F. A. Bryan is the general manager and secretary.

The Technolexicon of the Society of German Engineers.

At the beginning of 1901 the Society of German Engineers (Verein Deutscher Ingenieure) began the compilation of a universal technical dictionary in the three languages—English, German and French. Societies and individuals have responded generously to an invitation to collaborate, and up to May, 1903, there are 341 societies (42 in English, 272 in German, and 27 in French-speaking countries) co-operating in the work, either by the systematical collection of technical expressions of the specialties represented by them or in other ways, especially by the enlistment of collaborators and by placing technical publications in more than one language at the disposal of the "Verein," such as catalogues, price lists of machines, handbooks, etc. Through these societies the Technolexicon has found helpers in Great Britain, Germany, France, the United States, Austria, South Africa, India, Australia, Belgium, Canada, etc.

Among the English societies are the Institution of Mechanical Engineers, London; the Institution of Electrical Engineers, London; the Junior Institution of Engineers, London; the Society of Chemical Industry, London; the Institution of Mining Engineers, Newcastle on Tyne; the Iron and Steel Institute, London; the Society of Architects, London; the British Optical Association, London; the Optical Society, London; the Cycle Engineers' Institute, Birmingham; the South African Association for the Advancement of Science, Cape Town and Johannesburg, etc. Of American societies may be mentioned the American Society of Civil Engineers, New York; the American Society of Mechanical Engineers, New York; American Railway Engineering and Maintenance of Way Association, Chicago; the American Chemical Society, Brooklyn; the Western Society of Engineers, Chicago, etc. In Germany there is first of all the large majority of the local sections of the Society of German Engineers; then there are the Verein Deutscher Eisenbahnverwaltungen, the Verein Deutscher Chemiker, the Zentralverband der Preussischen Dampfkesselüberwachungsvereine, the Verband Deutscher Patentanwälte, the Deutsche Schiffbautechnische Gesellschaft, and many others. In France we mention: Société des Ingénieurs Civils de France, Paris; Association Amicale des Anciens Élèves de l'École Centrale, Paris; Société Internationale des Électriciens, Paris; Société d'Encouragement pour l'Industrie Nationale, Paris; Société Française de Photographie, Paris; Syndicat Général de l'Industrie des Cuirs et Peaux de la France, Paris, etc., etc.

Assistance has so far been promised—and partly already rendered—by 2,185 industrial establishments and individual collaborators. Among the industrial establishments may be mentioned the Westinghouse Brake Company, London and New York; J. J. Griffin & Sons, London; the W. T. Henley's Telegraph Works Co., London; Fraser & Chalmers, Erith (Kent); Twyfords, Limited, Hanley (Staffs); Sherwin & Cotton, Hanley (Staffs); Walter E. Mason, Horwich (Lancashire); the Trenton Iron Company, Trenton, N. J.; the B. F. Sturtevant Company, Boston and Berlin; the Thomas D. West Company, Sharpsville, Pa.; Manning, Maxwell & Moore, New York; the Fairbanks Company, New York and London. Fried. Krupp in Essen, and the Fried Krupp-Grusonwerk in Buckau-Magdeburg; the Kaiserliche Torpedowerkstatt in Friedrichsort-Kiel; Siemens & Halske, Aktien-Gesellschaft, Berlin and Charlottenburg; Vereinigte Königs and Laurahütte, Königshütte (Silesia); Arthur Koppel, Berlin, New York, Cape Town, etc.; Gebr. Körting, Körtingsdorf, near Hanover, London and Paris; Blohm & Voss, Hamburg; Elsässische Maschinenbaugesellschaft, Mülhausen and Grafenstaden; Whitehead & Co., Fiume. J. & A. Niclausse, Paris; Panhard & Levassor, Paris; Delaunay-Belleville, St. Denis; Schneider & Co., Le Creusot; Administration des Chemins de fer Paris-Lyon-Méditerranée, Paris; Fabrique nationale d'armes de guerre, Herstal-Liège; Société anonyme John Cockerill, Seraing, near Liège; Administration des Mines, Morlanwelz, near Mons, etc., etc.

Excerpts from dictionaries like Sachs-Villatte, Muret-Sanders, Tolhausen, etc., and of thousands of catalogues and price lists, of handbooks, store lists, custom tariffs, etc., have yielded 1,200,000 filled-out word blanks up till May, 1903. To them will be added within the next two years the hundred thousands of words the contribution of the collaborators will supply. For convenience the Society of German Engineers has provided handy note books (each with 3 indices A—Z) for the collaborators. These books will be called in by the editor-in-chief in the course of 1904. So far already 207 filled-out note books have been forwarded voluntarily to the office at the address given below.

As the contributions will not be called in before 1904, all who wish to help in the compilation of the Technolexicon have still time and opportunity to assist in the preparation of their specialties. Contributions from all technical branches (including the handicrafts) are welcomed, and it is obvious that small contributions from a host of various collaborators will be more useful than large ones compiled by a few men, who naturally cannot cover so many specialties. Attention is directed to the fact that contributions in only one language are also most acceptable, though of course those in two or three languages are the most valuable, as also polyglot business catalogues and other technical publications. Contributions, if received before the end of 1906, when the matter will go to press, can still be made use of. The editor-in-chief will give any further information requested, and may be addressed as follows: Technolexicon, Dr. Hubert Jansen, Berlin (N. W. 7), Dorotheenstr. 49.

Rankine as a Poet.

That the controversy over the metric system is not new, and that the line of argument put forth by its opponents undergoes little change with generations, are points illustrated in the following verses, written by W. J. Macquorn Rankine, in 1864, which also recall the singular fact that almost all great mathematicians have shown a decided propensity for poetry:

THE THREE-FOOT RULE—A SONG ABOUT STANDARDS OF MEASURE.

I.

When I was bound apprentice, and learned to use my hands,
Folk never talked of measures that came from foreign lands;
Now I'm a British Workman, too old to go to school;
So whether the chisel or file I hold, I'll stick to my three-foot rule.

II.

Some talk of millimetres, and some of kilogrammes,
And some of decilitres, to measure beer and drams;
But I'm a British Workman, too old to go to school;
So by pounds I'll eat, and by quarts I'll drink, and I'll work by my three-foot rule.

III.

A party of astronomers went measuring of the earth,
And forty million metres they took to be its girth;
Five hundred million inches, though go through from pole to pole;
So let's stick to inches, feet and yards, and the good old three-foot rule.

IV.

The great Egyptian pyramid's a thousand yards about;
And when the masons finished it, they raised a joyful shout;
The chap that planned the building, I'm bound he was no fool;
And now 'tis proved beyond a doubt, he used a three-foot rule.

V.

Here's a health to every learned man that goes by common sense,
And would not plague the workman on any vain pretence;
But as for those philanthropists who'd send us back to school,
Oh, BLESS their eyes, if ever they tries to put down the three-foot rule!

Awards to Scientists.

The Executive Committee of the Carnegie Institute, Washington, reports that the entire sum of $200,000 allotted to grants for original research has been distributed, and that of the $40,000 set aside for publications to be made this year, $20,000 has been assigned to special publications, leaving $20,000 still at the disposal of the Executive Committee. No more grants for researches will be made until after the next meeting of the Board of Trustees, which will be held in December. At the meeting of the Executive Committee last week the question of giving more publicity to the grants of the institution was not taken up. The policy hitherto has been to permit the receivers of grants to make them public, but for the officials of the institutions to refrain from giving out names of the fortunate scientists who receive these grants. It is probable that this policy will be continued.

Telephone Meeting of the Chicago Branch, A. I. E. E.

A most successful and well-attended meeting marked the close of the spring programme of the Chicago branch of the A. I. E. E. on May 19. The evening was devoted to the reading of several papers on telephone work by representatives of both the Bell and independent interests. The programme was prepared under the able direction of Mr. Kempster B. Miller, engineer of the Kellog Switchboard & Supply Company, and Mr. Angus S. Hibbard, general manager Chicago Telephone Company.

S. G. McMeen, engineer Western Electric Company, read a paper "Concerning the Telephone Engineer," in which he discussed the status of the professional standing of the telephone engineer. In conclusion he offered the following definition of a telephone engineer: "A telephone engineer is one who practices the design and construction of telephone apparatus, telephone circuits and telephone operating methods, and the correlation of all three into systems of telephone communication. If this definition be granted, then a place for him may be claimed among the engineers of more classical reputation, giving him credit for his accomplishment and our best wishes for his future."

Mr. J. G. Wray, Chicago Telephone Company, discussed "Some Features of Telephone Traffic and Their Effect upon Service." This paper brought out very interesting data concerning the operation of different telephone systems, and forcibly illustrated the fact that the central station man alone is not confronted with the problem of caring for an ever fluctuating load.

In a typical telephone exchange, he said, the load curve indicating the volume of traffic shows during the midnight hours a value of from 1/10 of 1 per cent. to perhaps 5 per cent. of the maximum hourly load. This period of light load will vary from seven to fourteen hours, depending upon the location of the exchange and the habits of the telephone users. In the offices of the business district of a city like Chicago, very few calls are made between 7 P. M. and 7 A. M. Between the hours of 7 P. M. and 7 A. M. the calls per hour will vary from 1/10 of 1 per cent. to perhaps 1 per cent. of the maximum. Between the hours of 7 and 8 in the morning, traffic will rise to perhaps 5 per cent. of the maximum. The rise will be extremely rapid until the maximum load of the exchange is reached between 10 and 11 in the morning. About the noon hour, there is a cessation of business and the telephone traffic curve shows a drop of perhaps 40 per cent. below the maximum. After the lunch hour, when business has been resumed, the traffic curve rises to an afternoon maximum between 2 and 3 o'clock. This maximum will be less than the maximum in the morning and will in a typical office approximate 80 per cent. of the maximum traffic of the day. From 3 o'clock until 5 or 5.30 P. M., there will be a rapid decrease in the traffic load, with an almost complete cessation of business at 6 o'clock.

In a residence district, the slump of traffic at noon time is not very well marked. There is, however, a decrease in the number of calls made late in the afternoon and a corresponding increase in the number of calls for the telephones of a residence district, the latter arising from the fact that the head of the house wishes to explain why he cannot come home to dinner or to announce that he wishes to bring a friend. The evening traffic is also a feature of the residence district. Social calls are made, appointments for the theatre, invitations, etc., etc. Evening traffic of a residence district often continues heavy until 9 or 10 o'clock; indeed, in one of the Chicago offices the evening traffic runs from 30 to 60 per cent, of the maximum, and heavy traffic is maintained until nearly midnight. The curve of traffic indicates in a measure the habits of the people in the district.

In the main office district here in Chicago the business day may be said to have begun at 8.30 in the morning. There is a partial cessation of business for lunch in between 12.30 and 1.30 o'clock, and the business day closes at about 5.30 P. M.

For central office also in the down-town district the business day is from 8.30 in the morning until 5.30 in the afternoon, with scarcely any let-up for lunch. Lawyers predominate in the central district.

In the Harrison office the day is the same as for central and main, but there is a marked reduction in the traffic between 12.30 and 1 o'clock.

The South office business day is practically from 8 o'clock in the morning until 9 o'clock in the evening, and even later, with no indications of a luncheon hour. North office telephone users are satisfied with a shorter day than the people of the South office district, the limits being from 8 o'clock in the morning until 8 o'clock in the evening. For West office the limits are from 8.30 in the morning until 9 in the evening.

For the Monroe office the traffic shows heavy business from 7.30 in the morning to 6 o'clock in the evening, with a distinctly marked lunch hour between 12 and 1. This is a manufacturing district.

In the Wentworth district, out in Englewood, the business of the day is done between 8 A. M. and 6 P. M., with some indications that the people have lunch between 11.30 and 1 o'clock.

A similar comparison of traffic load curves of other cities will be of interest. In Philadelphia, for example, we find the heavy traffic between 9 A. M. and 5 P. M., with lunch between 1 and 1.30.

In Boston the traffic shows a work day from 9 A. M. to 5 P. M., with time for luncheon in different offices varying from one and a half to two hours between 12 and 2 o'clock.

New York telephone users seem to take life even more serenely than those of Philadelphia or Boston, and we find the work day beginning as late as 9.30 in the morning and ending at about 4.30 in the afternoon, with two hours for lunch between 12 and 2 o'clock.

Telephone traffic varies with the seasons as well as with the time of day. The Canal office district of the Chicago Exchange shows a fluctuation of 50 per cent. between summer and winter traffic. This is caused by the vast lumber interests of the district, which practically close down during the winter months. There is a heavy rush of traffic in April and May, followed by a 40 per cent. reduction in traffic during July and August. In the fall business increases to a maximum in September. This is followed by a 50 per cent. reduction in traffic, culminating in January. A change in the character of the traffic from Canal district, however, has been noticed within recent years, and the wide variation of traffic with the seasons is less marked.

The traffic of all offices slumps decidedly during the summer months. There is a reduction of perhaps 30 per cent. during July and August, the vacation period.

The volume of traffic of a telephone exchange is also an infallible index of general business conditions. This is shown by the fact that during 1894, 1895 and 1896 there was very slight increase in traffic. With the return of prosperity, however, the traffic has increased by leaps and bounds, until now it will approximate four times as heavy as during 1895 and 1896. In passing it will be of interest to note that for 10 hours per day the traffic of Chicago Exchange ranges above the average hourly traffic figured on a 24-hour basis. For the other 14 hours per day the traffic is much lower than the average hourly traffic.

The average traffic for the maximum hour is about 2½ times the average traffic of the day, and perhaps 200 or 300 times the traffic of the hour of minimum traffic. The percentage and ratios of traffic given herein take no account of rushes of traffic for short intervals due possibly to the news of a prize fight, a fire, a panic or a football game. These and the tremendous rushes of traffic always preceding or following every important holiday, make a severe test of the resources of the operating plant.

The traffic of Saturday forenoon is always the heaviest of the week, and is taken as a basis for the adjustment of operators' loads and the loads on trunk lines. The adjustment of the operator's load must be made with a view to handling the traffic well during the busiest hour of the day. Experience has shown that approximately ⅛ of the business of the entire 24 hours must be handled during the busiest hour.

"A System of Selective Signaling for Telephone Lines" was described by Mr. W. W. Dean, engineer of the Kellogg Switchboard & Supply Company. This is a new four-party line system, the theory of which was discussed by Prof. Carl Kinsley, of the University of Chicago, while some of the actual operating features were considered by Mr. K. B. Miller.

In a short discussion which followed Mr. J. G. Wray called attention to the advantage of having a system with grounded wires, as it affords protection against lightning discharges and other currents which might accidentally be discharged into the system.

For the purpose of arousing interest among the members, so that a large delegation representing the Chicago membership, more especially so as the newly-elected president of the Institute, Mr. Bion J. Arnold, is a Chicago man, the chair was empowered to appoint a committee of three members, this committee also to provide transportation facilities for those attending the Institute meeting at Niagara Falls in July.

Western Union and Pennsylvania Railroad.

The differences between the Western Union Telegraph Company and the Pennsylvania Railroad over the removal of the former's lines from the railroad company's right of way last week assumed a violent form.

In last week's issue reference was made to the decision of the Pittsburg United States Circuit Court of Appeals to the effect that the Pennsylvania Railroad Company had a legal right to remove the wires and poles of the telegraph company located along its right of way. Counsel for the Western Union Company asked for a delay, as steps were being taken for an immediate appeal to the United States Supreme Court in the New Jersey case, but Judge Buffington, of the Pittsburg Court, said every opportunity had been given to prepare for the decree and further delay was unreasonable. Immediately after the court's decision the railroad company (on Thursday) began the work of chopping down the poles, and wrought havoc to the telegraph company's lines along the main line of the railroad between Philadelphia and Pittsburg and on the road between Camden and Atlantic City in New Jersey. More than one thousand men took part in the work of destruction and in a short time the wires and poles covered the ground for a distance of many miles. Lines were also chopped down along the Cumberland Valley road from Chambersburg to Harrisburg, and all the poles and wires attached were thrown into the fields. Along the main line Lewiston was isolated from the rest of the world as far as the Western Union Telegraph service was concerned.

It is stated that the Western Union had prepared for such a move on the part of the railroad company by completing its independent system and that there was no serious interruption to its business. According to the newspaper accounts, 1,500 miles of telegraph line and 15,000 miles of wire were chopped down, the total value of the property being placed at $750,000.

Announcement was made by ex-Judge Dillon, counsel for the Western Union interests, that the matter would be carried to the United States Supreme Court. Mr. Esterbrook, general solicitor of the Western Union Telegraph Company, said that he did not think that the United States Supreme Court would tolerate the action of the Pennsylvania Railroad or uphold the lower courts. President Clowry, of the Western Union, states that the reports of the damage done are greatly exaggerated, and that the company's service was not crippled; that it is going on as usual, and is being handled without delay.

A dispatch from Pittsburg stated that the cutting of the wires by the railroad company compelled the Baltimore & Ohio Railroad Company to run its trains temporarily by telephone. This was due to the fact that some of the Baltimore & Ohio wires were on the same poles with the Western Union wires in the neighborhood of Pittsburg. The telegraph company arranged to reach points where its wires did not go by telegraphing to the nearest station, and telephoning the rest of the way. An agreement to this end, it is stated, was made with the American Telephone & Telegraph Company.

At the last writing President Clowry, of the Western Union Company, makes the announcement that the company is able to transmit messages to all points reached before the Pennsylvania Railroad Company began to cut the wires and poles along its lines. There has been no serious interruption of the service at any time, he said, as the Western Union had been for months stringing wires over independent lines. Special care had been taken to protect the leased wire system against any interference. He stated that the cutting of wires had been wholly confined to the State of Pennsylvania, and that the lines within the State of New Jersey were protected by an order obtained from Judge Kirkpatrick at Newark. "At present," he said, "we are sending messages to every point hitherto touched by us, and the receivers at all of our offices have instructions to refuse no messages."

It will be noted above that President Clowry denies that any of the company's property in New Jersey was interfered with, notwithstanding the dispatches referred to in the early part of this account to the effect that the lines on the Atlantic City road had been chopped down.

The following statement is made by Mr. Charles M. Schaeffer, superintendent of telegraph of the Pennsylvania Railroad:

"The Western Union Telegraph Company, under its contract with the Pennsylvania Railroad Company, bound itself upon six months' notice after the termination of the contract to remove its poles and wires from the property of the railroad company, and upon their failure to do so the contract provided that the Pennsylvania Railroad Company had the right to remove the poles and wires at the expense of the telegraph company.

"Further, that the Pennsylvania Railroad Company, in order to save the telegraph company the expense and loss incident to the removal of the poles and wires, had offered to purchase the lines at a fair valuation, but that the Western Union Telegraph Company had evidently preferred to allow the Pennsylvania Railroad Company to tear down and remove them at its expense.

"The Pennsylvania Railroad Company having entered into a contract with the Postal Telegraph Company to provide it with facilities on its lines, was compelled to proceed to remove the poles and wires of the Western Union Telegraph Company, in order to put themselves in a position to carry out their agreement with the Postal Telegraph Company, as the right of way occupied by the Western Union Telegraph Company was necessary for that purpose."

Programme of A. I. E. E. Niagara Meeting.

Following is the programme, so far as has been determined to date, of the Niagara meeting of the American Institute of Electrical Engineers. The papers named will be read and discussed at morning sessions:

MONDAY, JUNE 29, INSTITUTE AND PRESIDENT'S DAY.

1. President's Address.
2. Institute Branch Meetings, their Organization, Development and Influence, by Calvin W. Rice.
3. The Energy Transformations in the Synchronous Converter, by W. S. Franklin.
4. Commercial Alternator Design, by W. L. Waters.

Afternoon.—Visits to local points of interest. No pre-arranged programme.

Evening.—An exhibition of the Hewitt converter and the mercury vapor lamp, by P. H. Thomas.

TUESDAY, JUNE 30, ELECTRICAL DAY (RAILWAY PAPERS).

1. High-Speed Electric Railway Problems, by A. H. Armstrong.
2. Storage Battery Industrial Locomotives, by Frank L. Sessions.
3. Predetermination in Railway Work, F. W. Carter.
4. Car Run Tests, by W. E. Goldsborough and P. E. Fansler.
5. Some Recommendations Concerning Electrical and Mechanical Specifications for Trolley Line Insulators, by Samuel Sheldon and J. D. Keiley.
6. The Storage Battery in Sub-Stations, by W. E. Goldsborough and P. E. Fansler.

Afternoon.—Technical tour of inspection of electrochemical and other electrical installations operated by Niagara Falls power, and the power houses of the Niagara Falls Power Company. Reception by Niagara Falls Power Company on terrace of power house No. 2.

Evening.—Dance under the auspices of local committee, at Cataract House.

WEDNESDAY, JULY 1, NIAGARA DAY (POWER TRANSMISSION PAPERS).

1. On the Testing of Electrical Apparatus for Dielectric Strength, by P. H. Thomas.
2. Choice Frequency for Very Long Lines, by P. M. Lincoln.
3. Method of Entering Buildings with High-Tension Wires, by C. E. Skinner.
4. Y or △ Connection of Transformers, by F. O. Blackwell.

Afternoon.—Trolley trips to Niagara Gorge, Fort Niagara, Brock's Monument, Chippewa. Technical visits to following plants: Niagara Falls, Hydraulic Power & Manufacturing Company, Canadian Niagara Power Company, Natural Food Company.

Evening.—Entertainment, Cataract House, under auspices Local Committee and General Committee.

THURSDAY, JULY 2, EXCURSION DAY (MISCELLANEOUS PAPERS).

1. The Factors which Affect the Energy Losses in Armature Cores, by J. Walter Esterline and Clarence E. Reid.
2. Central Station Economies, by W. E. Goldsborough and P. E. Fansler.
3. The Electrical Equipment of a Gold Dredge, by Ralph L. Montagu.
4. The International Electrical Congress of 1904, by Elihu Thomson.

5. The Legalized Standard of Electromotive Force, by H. S. Carhart.
6. Symbols and Nomenclature, by Carl Hering.
7. A Universal Telegraphic Code, by G. O. Squier.
8. The Magnetic Units, by A. E. Kennelly.

Afternoon.—Technical excursions to Olcott Beach, St. Catharine's, Lockport, Tonawanda Sub-Station.

Evening.—Illumination of Gorge Route.

FRIDAY, JULY 3, BUFFALO DAY.

Joint meeting with the Society for the Promotion of Engineering Education.

Papers will be presented by the following members of the Institute: W. S. Franklin, J. G. White, E. H. Mullin, B. Gherardi, Jr., L. A. Osborne and T. J. Johnston.

Afternoon.—Technical trips to Buffalo, Buffalo General Electric Company, Buffalo Terminal House.

Commercialism in Universities.

A conference was held in Chicago, on May 8 and 9 to discuss the relation of the college to the professional school. It was called by President James, of Northwestern University, and about 100 representative educators, including over forty presidents, of colleges and universities, assembled to consider what changes should be made in college courses to enable these time-honored institutions to hold their useful place in our educational system, and not be set aside in favor of institutions offering the shorter combined courses leading to practice of the professions and mechanical arts. So the discussion was guided by the propositions in the following questions:

"Has the college a field peculiar to itself, not covered by the technical school or by the demands of preparation for the professional school?"

"Is it desirable that the college course should be reduced in time from four to three or even two years and correspondingly in amount of work?"

"What subjects in the typical college course can be accepted by the professional school as qualifying in part for the professional degree so as to shorten the time required for graduation in the professional school?"

"If reduction is allowed should it be by (*a*) acceptance of credits in the college of liberal arts for work done in the professional school, or (*b*) by acceptance in professional school for work done in the college of liberal arts, or (*c*) by combining these plans?"

"The relation of the technical school to the college."

Four technical schools as such were represented at this conference —Rose Polytechnic Institute, Terre Haute, by President C. Mees; Armour Institute of Technology, Chicago, by President Frank W. Gunsaulus; Lewis Institute, Chicago, by Director George N. Carman, and the Massachusetts Institute of Technology, by Dr. Harry W. Tyler. Naturally the discussion of the conference was not a little in the line of explanation and defense of the traditional four years' college course, being a course designed to humanize and broaden the youth, preparing him to reason when he should take up the specialized work of the professional schools, and to be fit for public service should he end all institutional instruction when his college gives him its bachelor's degree. But whatever the theory of the bachelor's degree, and the honorable work for civilization done by two centuries of American college graduates, short cuts to a professional degree are increasing in number, and hence the anxiety of the small colleges and professional schools to forecast the future and by alliance and adjustment secure their own perpetuation with profit and honor.

The conference adopted no platform, but it arranged for a meeting next year, and, what is more, for a national college association. It directed President James, of Northwestern University; President Merrill, of Colgate University, and President, King, of Oberlin College, to appoint a commission of fifteen who should call a similar conference in May, 1904, provide a programme, and report a plan of membership and organization. In the above-quoted list of topics discussed at this conference may be seen a manner of approach to the problem of concession and reciprocity in courses by which both colleges and universities may find it possible to get together—to reach affiliation as Prof. Monroe Smith, of Columbia, in an able discussion on the interchange of credit, said he hoped would result instead of subordination.

Two notable addresses at this conference were by President Frank W. Gunsaulus, of Armour Institute, perhaps Chicago's most eloquent clergyman, and by Dr. Harry W. Tyler, of the Massachusetts Institute of Technology. The former was an appeal to resist the commercialism of the age so far as to refuse to turn out from our technical schools machines in place of men. The latter was a broad study of the relation of the school of technology to general education. With tribute to what Director Carman, of the Lewis Institute, and what the Massachusetts Institute of Technology were trying to do in way of making men as well as engineers, Dr. Gunsaulus in part said:

"If you would know the brutal wave of commercialism beating in fullest power stand in an institute of technology. When for years you have withstood that assault, your high ideals questioned, you are ready to say to that brutal wave, 'Thus far shalt thou go and no farther.' I thank Dr. Tyler and the Massachusetts Institute of Technology for the determinative force in the mind of Mr. Armour, that great man of pork, beef, sides and wheat, whereby he came to the conclusion that the American youth must take time enough to prepare for a career of manhood. The question of questions is whether we shall supply these vast industrial instrumentalities with youth to be consumed, or whether we shall keep and train and make our boys powerful for civilization. Schools of ample endowment have enormous responsibility. The work of Lewis Institute is one of conservatism for the Mississippi Valley. Only the strong schools can be conservative. For ten years Armour Institute has been getting ready. The voices of fathers cry, 'Here is my boy; graduate him quick.' The voice of the callow, soft and vealy youth, with absolutely no self-control, says, 'Graduate me quick.' Hustling has come to be a positive disease. God save us from strenuosity in education. Twenty-five years hence, when we get our poise, we are going to ask some awful questions with regard to the positive ferocity with which we are seeking for students in some of our schools, and with regard to the criminal velocity with which we are pushing them out into life. Schools of technology must give the culture of soul and brain; the whole man is our man. We can't afford to cut off the top in instruction; rather let us broaden the bottom. Let all point toward manhood; intellectual method is better than information."

Dr. Tyler, in his elaborate paper, made the point that "The school of technology has the right and duty to make its requirements of general education such that the aggregate value and efficiency of its graduates shall be a maximum, diminished neither on the one hand by too narrow training of a great number of men, nor, on the other, by the undue restriction of numbers in consequence of a standard too broad or too high. The professional school may accept responsibility for general as well as for professional education, and, requiring literary as well as scientific subjects for admission, may undertake more or less successfully to combine certain fundamental elements of general education; for example, English, history and economics, with its own professional instruction. The main difficulty of this plan is that of time. Or, the professional school planning its courses for graduates of secondary schools, may at the same time make provision for college graduates to enter with advanced standing, in such a manner that their total period of education may not be unduly prolonged.

Electrical Annunciator Drop Litigation.

Judge Wing, sitting in the United States Circuit Court of the Northern District of Ohio, handed down a decision on May 26 in a case involving the Warner annunciator drop, the patent on which he declared invalid through lack of novelty in view of the prior art. The patent (477,616) was granted June 21, 1892, on an application filed June 17, 1889. Following is one of the claims:

"The combination with a coil or helix, of a soft iron shield surrounding the same, the armature at the rear of the core of the helix, and the armature lever extending forward through a slot or opening in the plate, and a drop with which the lever is adapted to be engaged when the drop is lifted, and to be disengaged therefrom when the armature is attracted."

The parties to the litigation were the Western Electric Company, complainant, and the North Electric Company, Cleveland, defendant.

Recent Electrochemical Developments.

By Clinton Paul Townsend.

PRODUCTION OF SODIUM CHROMATE.

Heinrich Specketer, of Griesheim-on-the-Main, Germany, assignor to Chemische Fabrik Griesheim Electron, produces sodium chromate and caustic soda as principally products by electrolyzing sodium sulphate in a cell provided with a diaphragm, employing an anode of ferrochromium. The reaction is controlled by the addition to the anode compartment of caustic lime in quantity sufficient to combine with the chromic acid formed at the anode and to precipitate the dissolved iron as hydroxide. Calcium chromate exists in the anode solution only as an intermediate product, reacting at once with the sodium sulphate of the electrolyte to yield sodium chromate and calcium sulphate. At the beginning of the operation the anode compartment contains a 25 per cent. solution of sodium sulphate and the proportion of calcium hydrate above indicated; in the cathode compartment is a saturated solution of sodium sulphate. A current of 1½-2 amp. per square decimeter at 2½-3 volts is continued until the concentration of chromic acid in the anode compartment reaches 100 grammes per litre, when the operation is interrupted, the precipitated calcium sulphate and ferric hydroxide separated by filtration from the anode liquor, and the latter concentrated to crystallize the sodium chromate. The cathode lye, in which a proportionate quantity of caustic soda has accumulated, is likewise concentrated to separate the residual sodium sulphate which may then be returned to the cell.

CARBORUNDUM AND ALUMINA.

The combination of two or more processes in electrometallurgy in such manner as to yield their distinct products or a modified product, has long been a favorite project, and reference was made to a series of such proposals in the issue of this journal of December 27, 1902. The most recent effort in this line is found in a patent issued to Dr. F. C. Weber, of Chicago, the aim in this case being to produce carborundum from aluminum silicate and carbon, with the simultaneous production of alumina of such purity as will warrant its use for the separation of the metal. The proposed method is extremely simple in outline, consisting in calcining a suitable hydrous aluminum silicate, such as kaolin or fire clay, and thereafter mixing the same with its due proportion of carbon and subjecting it to sufficient heat to produce the carbides of silicon and aluminum.

The specification gives no data from which it is possible to conclude whether this step of the process occurs in a clear-cut and definite manner; that is to say, whether the sole solid products of the reaction are carborundum and aluminum carbide, and whether the impurities present are of such kind or in such proportions as to interfere with the technical success of the method and the commercial value of the products. This is, of course, the point upon which the value of the method turns, and it is precisely upon this point that the specification fails to supply the required information.

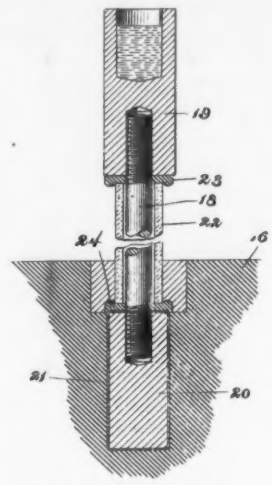
Given a pure mixture of silicon carbide and aluminum carbide and the separation is easy, for the former is unaffected by water, whereas the latter is decomposed, yielding methane and aluminum hydroxide. According to the patented method this hydroxide is washed away from the carborundum, dried and calcined, and utilized in the usual fluoride baths for the separation of aluminum.

ANODE CONNECTOR.

The accompanying figure illustrates a connector applied by Mr. Hugh K. Moore to gas carbon anodes for use in sodium chloride solutions. Mr. Moore has found such electrodes to be porous to a degree which interferes seriously with the sustained efficiency of the cell, the difficulty arising largely from their absorption of the brine, and the consequent corrosion of the metal terminal; furthermore, the salt tends to separate at the surface of junction of the metal and the carbon, increasing the potential fall and heat development at this surface, the latter acting to accelerate the separation of salt until the efficiency of the connection is lost.

The carbon anode, 16, is drilled for the reception of a copper plug, 20, into which the anode rod, 18, is screwed; between the copper and the carbon is a sheath or bushing, 21, of platinum or other metal unaffected by chlorine. The anode rod, 18, is surrounded by a tube, 22, of glass, sealed above and below by rubber packing rings, 23, 24, which may be compressed by screwing down the mercury cup or terminal, 19. The coefficient of expansion of platinum being intermediate between those of copper and carbon, and its position being also intermediate, it is apparent that the rise of temperature of the cell in operation serves to increase the effectiveness of the contact.

A somewhat similar connector was patented abroad in 1896 to Siemens Bros. According to their construction the carbon was drilled, the socket lined with platinum, and an alloy of bismuth, lead and tin, possessing the property of expanding upon cooling, was cast in the whole, this plug of alloy serving to force the platinum



ANODE CONNECTOR.

into close contact with the carbon and affording a means of connection to the current leads.

The efficiency of these connectors cannot be questioned. Even graphitized anodes have a certain porosity, and unless means are adopted for preventing access of the brine to the connector the use of platinum as a sheath for the latter would seem to be necessary. It appears, however, that the simpler expedient of immersing the ends of the carbons in boiling paraffine has proven in practice to answer every requirement in preventing access of the electrolyte or its corrosive products to the metal. (Compare *Transactions* American Electrochemical Society, Vol. 1, page 62.)

New Telephone Patents.

In the Patent Office issue of a week or two ago there appeared a selective telephone system patent which was temporarily overlooked. This patent is sufficiently broad in its scope to be of considerable interest to those following the selective signal question, and a few words concerning it may not be amiss at this time. The patent in question is No. 726,476 of the issue of April 28, 1903, which was granted to John S. Stone, of Cambridge, Mass., and assigned to the American Bell Company. This patent covers broadly the use of what the inventor terms "sonorous" circuits as signal current generating devices. The system considered is of that type wherein the selective feature depends upon the frequency of the signalling current, the signal-receiving apparatus at each station being included in a circuit tuned to or resonating with a particular frequency only. The "sonorous" circuits have corresponding characteristics, but contain a source of current. When the current or potential is suddenly altered the sonorous circuit by virtue of the inductance and capacity included in it, sets up a wave of the characteristic frequency. By proper tuning this frequency may, of course, be that to which any one of the resonating circuits responds. Further, if two or more of the sonorous circuits are simultaneously disturbed, the composite wave resulting on the main line will be separated into its components by the resonating circuits, and several stations may therefore be called at once, if so desired.

The patent issue of May 12th is very remarkable from a telephone standpoint, as it contains fifteen patents relating to that art. Of these eleven were considered in our last week's issue. Of the remainder one of the more interesting is that of J. J. O'Connell, covering a telephone cable terminal or pot-head splice. Every one knows the difficulty of efficiently and cheaply terminating a paper-insulated lead-covered cable. A few years has seen the costly cable head largely superseded by the true pot-head splice, this being a splice between the paper-covered wire and rubber-covered wire, the whole enclosed in an enlargement of the cable sheath and impreg-

nated with a water-proof adhesive compound. This, too, is expensive. Of late iron cable boxes to which the cable sheath is soldered and which can be filled with compound have been tried quite successfully. Such boxes have contained terminals to which the distributing wires must be led in.

Mr. O'Connell combines the pot-head and iron box principles, his terminal being shown in Fig. 1. As may be seen, an iron pipe is first passed over the cable core from which the lead covering has been removed, and it is then driven down tightly over the end of the sheath. Then the core rubber-covered wires are spliced just outside the pipe and these latter are bent down along the side of the pipe and distributed about the periphery of it, as evenly as possible. Tape is applied at the base of the pipe and to the wires to bind the whole together. The tape is then continued around the last layer of rubber wires until an outer pipe may just be forced over it. This outer pipe is next filled with adhesive compound binding, thus hermetically sealing the splice. Besides the question of cost, another advantage is derived from this arrangement of parts. This is the impeding effect of the half turn of each wire about the inner iron pipe, which effect assists the lightning arresters materially in keeping discharges out of the cable.

A new telephone switchboard lamp has been patented by A. D. Whipple, his patent being assigned to the Kellogg Company. This lamp is of the tubular form with the terminals cemented to the side of the lamp so as to register properly with the lamp jack. The usual wood block for securing the rearward extension of the terminals, present in most such lamps, is not here used. In this lamp the securing of the terminals is accomplished by providing a cap of

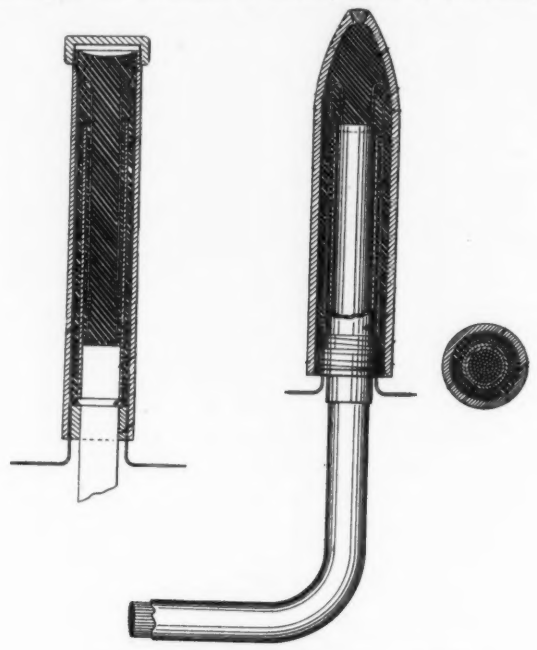


FIG. 1.—O'CONNELL CABLE TERMINAL.

lava for these extensions and filling it with a suitable cement. The terminal extensions are bent toward each other and are transversely curved. The cement thus engages them and adheres to the lamp and cap, binders securing the parts together strongly.

"Electrical Protective Device" is the title of a patent of the May 12 issue, granted to E. B. Ellicott, of Chicago. As this device is in the nature of a circuit-breaker, and may be readily reset, it seems to have considerable merit for subscribers' station use. It is shown in section in Fig. 2, from which figure the operation will be nearly self-evident. The main line is carried through the rod to the coil frame and thence through the coil. The rod is normally latched against the force of the spring. When an excessive current occurs, the adjustably weighted armature being attracted, strikes the point of the rod and, raising it, allows it to fly away from the frame contact. The armature at the same time closes the spring contact above it and grounds the line, if this be desired. Resetting involves merely pushing the rod back home.

The last patent of the May 12 issue is that for a "Telephone Special Directory," which is in total a sheet of metal so apertured that it may be clamped against the transmitter face by the mouthpiece and carrying a ruled cord to serve for a directory of numbers and names frequently called.

Coming now to the issue of May 19, we have for first consideration an interesting form of self-releasing switch for intercommunicating systems. With such systems trouble has always been experienced, due to users leaving the switch set in positions other than the normal, and many devices more or less successful have been designed to obviate this difficulty. The present one is shown in Fig. 3. The line contacts are arranged in a vertical row, and are closed as desired by the wheel on the receiver hook. This latter slides upon the rod freely in an upward direction and freely downwardly as long as the receiver is on the hook. When the receiver is off the hook, the downward motion is arrested by a spring clamp. Thus the return of the receiver returns the switch, while the setting of the switch is accomplished by raising the hook manually until a pointer attached thereto

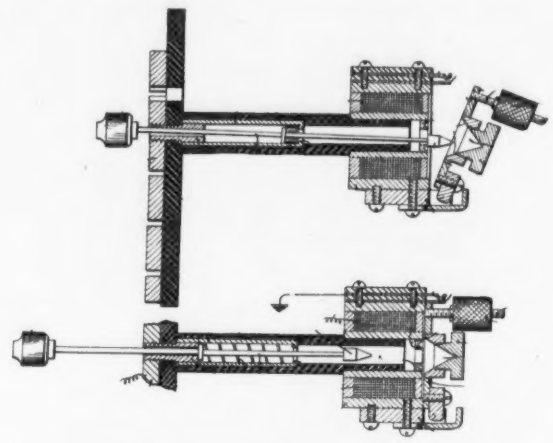


FIG. 2.—ELLICOTT PROTECTIVE DEVICE.

points to the desired number, all numbers being stamped upon the box cover in a vertical row.

Mr. George E. Wheeler has two of the patents of this issue to his credit, one describing a receiver and the other a transmitter. The receiver is designed with convenience of repair primarily in view. A sectional view of it is shown in the upper part of Fig. 4. This shows the case and magnetic portion constructed entirely independently and held together by the clamping of the cap. The pole pieces, supporting cup, magnet and insulating spacer are all held together by the same screws. The coils have a metallic strip connecting them which serves not only as a support, but also as a

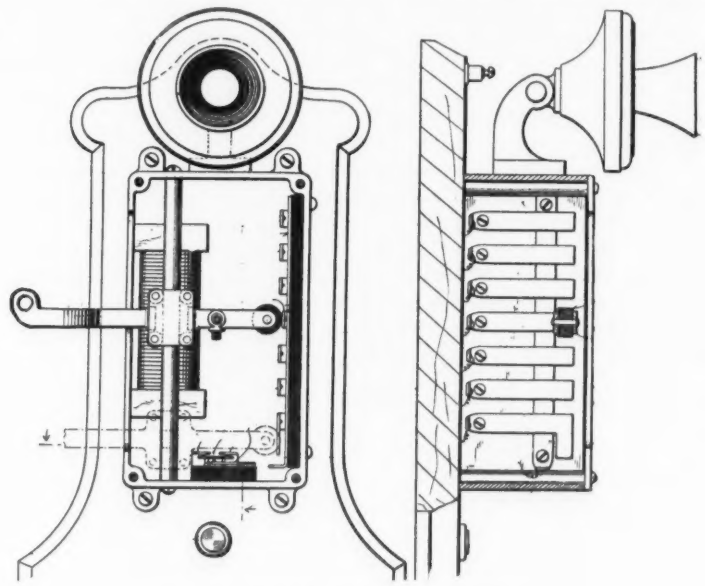


FIG. 3.—YURGAE TELEPHONE SWITCH.

connection between the inside ends of the windings. These are thus kept concealed and are unlikely to break off. The outside ends tap stiff terminals secured to the spacer block, to which terminals the cords may be lead in. Mr. Wheeler's transmitter, which is also shown in Fig. 4, is of very novel construction. The carbon electrodes are both stationary, one, 14, being secured directly to the button and the other, 13, being secured to it, though insulated from it by the sheet, 15. Within the button carbon granules are placed

and through it an agitator passes longitudinally. This agitator has no electrical connection, but acts mechanically, and may be of any cross section and fluted or tapered to better act upon the granules. One end of the agitator bears against the diaphragm while the other engages a variable tension spring. Many modifications are illustrated in the patent, one of these in which the electrodes are circular and vertically mounted being worthy of special note. In this case the agitator is a wire screen and within each mesh and between the vertical opposing faces of the electrode there is placed a rather large single granule. This gives a transmitter akin to the multiple microphonic type of foreign practice.

A messenger strand support forms the subject of a fourth patent; this is the joint invention of Messrs. H. F. Neslage and H. H. Watson, both of St. Louis. It is their object to provide a pole attachment which shall not only securely hold the strand, but which shall in addition form a guide to carry the cable hanger hooks over the support and thereby avoid the necessity of having a man at each

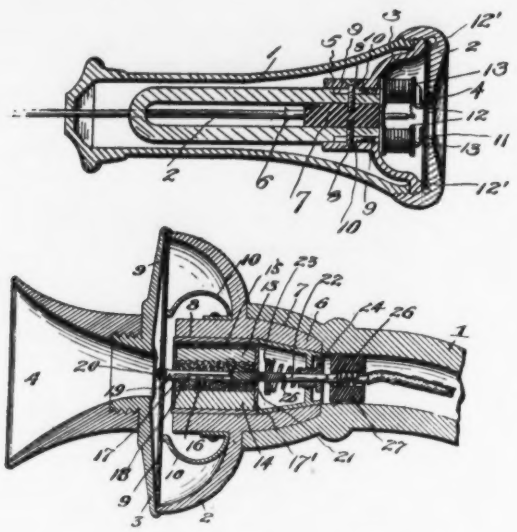


FIG. 4.—WHEELER TELEPHONE RECEIVER.

pole. The support is in two parts, one the support proper and the second a cap which screws down over the strand. This latter has rounded edges and a rounded top, which rises slowly from nothing at its ends to a height in the middle sufficient to carry the hanger hooks clear of the strand support. That the device will not be very successful in its present form, at least for many types of hanger, the experience of others has shown. To be most successful, the extremity of the guide must pass partly across the strand, its ends lying in a plane considerably below the top of the strand. By this means the guide is brought well beneath the hanger hook before the weight of the cable is transferred from the strand to the guide.

It is not very often nowadays that one sees new apparatus designed for series party line working. A system based upon such working is, however, the subject of a patent granted to E. Understock, of Kansas. As the field for such apparatus is rather limited, it suffices to say that the chief novelty embraces the obtaining of secrecy by causing any interloper to interrupt an existing conversation entirely and thereby give warning of his presence upon the line.

Municipal Plant Lighting for New York City.

Mr. R. F. Monroe, Commissioner of Water Supply, Gas and Electricity, has again advised Mayor Low, of New York City, to reject all public bids for lighting for 1903. He makes this recommendation after an investigation of the problem in which he retained Dr. Cary T. Hutchinson as consulting engineer. In his letter to the Mayor, Mr. Monroe says:

"Dr. Hutchinson has prepared an estimate of the cost of constructing and operating an electric light plant to supply ten thousand arc lamps, and to light all public buildings by electricity in the two boroughs above mentioned, and he has added a supplemental estimate for a plant to furnish such public building lighting and to supply five thousand arc lamps. This supplemental estimate is for comparison with the service of rented lights now installed.

"The present service, though actually somewhat less than five thousand 2,000-cp lamps, should grow to those figures by the end of the year, and therefore the number given is properly taken for a basis of comparison.

"In my report submitted to your board on March 13, 1903, I gave the average price paid by other American cities for 2,000-cp arc lamps as $88.60 per lamp per year. Dr. Hutchinson's estimate shows that if New York erects and operates a municipal plant of ten thousand lamps, a 2,000-cp arc lamp can be produced for $69.40 per annum. This price includes interest charges and 8 per cent. depreciation—a larger percentage than is actually necessary.

"The estimate submitted, while limited to Manhattan and the Bronx, sufficiently demonstrates what can be accomplished by the erection of a municipal electric lighting plant for all the boroughs, and taken with the data as to the cost of electric lighting in other cities submitted March 13, 1903, shows conclusively that the prices bid for arc lamps for 1903 are too high. Those prices are as follows:

"Manhattan and the Bronx, $146 per lamp per year for nominal 2,000-cp arc lamps. Brooklyn, $124.50 per lamp per year for nominal 1,200-cp arc lamps. Richmond, $125 per lamp per year for nominal 1,200-cp arc lamp. Queens, $124.10 per lamp per year for nominal 2,000-cp arc lamps.

Meeting of the New York Electrical Society.

The New York Electrical Society held its 235th meeting on May 20th, in the lecture-room of the American Institute, 19 West Twentieth Street, on which occasion a lecture was given by Mr. William J. Hammer, on "Phenomena of Radio-Active Substances, Radium, Polonium, Actinium and Thorium," which was preceded by a consideration of phosphorescence and phosphorescent substances. Mr. Hammer also, by special request, referred to a recent visit to the Finsen Institute, at Copenhagen, Denmark, describing the system employed in the treatment of disease by the ultra-violet rays, and illustrating his remarks by many interesting lantern slides.

He showed some lantern slides representing the practical applications of selenium, during which he exhibited apparatus employing selenium in connection with wireless telephony, etc. A cannon was also fired over the heads of the audience by merely waving the lecturer's hand between an acetylene flame and a selenium cell, the cell varying its resistance sufficiently to operate a relay and battery, which in turn fired a cannon. The lecturer also showed a large number of lantern slides illustrating the various phenomena in connection with phosphorescence and radio-activity, exhibiting a very extensive collection of phosphorescent substances. Many of these were caused to glow in the dark by being stimulated in various ways, such as by burning magnesium wire, by heat, by friction, by ultra-violet light, by discharging electricity through vacuum tubes, by cathode rays, by oxidation or slow combustion, etc. Practical applications of phosphorescence were illustrated by switches, socket taps, signs, etc., painted with various phosphorescent substances. Certain phosphorescent substances exhibited, showed practically all of the colors of the spectrum presenting a beautiful appearance in the dark.

The principal subject of the lecture was that of Radio-Activity. The lecturer threw upon the screen various illustrations of experiments of his own and of others, showing the X-ray and cathode ray characteristics of radium rays, their wonderful penetrative effects, etc., and he gave a lengthy dissertation upon the physiological effects presented by radium, their chemical effects, their ionization of the air, discharging of negatively electrified bodies, their destruction of microbic life, and various other phenomena. Mr. Hammer exhibited a 3-pound cannon ball or shell, in the center of which he had placed a few decigrams of radium, which radiographed the image of the shell upon a photograph negative after an exposure of seven days.

At the close of the lecture some interesting remarks were made by President Sheldon, supplementing the lecture of the evening.

The following ticket was nominated for the season 1903-'04: For president, J. J. Carty; for vice-presidents, N. I. Donshea (for re-election), Hobart D. Betts (for re-election), W. S. Barstow (for re-election), Douglass Burnett, F. C. Bates, H. C. Townsend; for secretary, George H. Guy; for treasurer, Henry A. Sinclair.

In the report of the Nomination Committee, which was read to the meeting, it was stated that the committee, prior to its nominating meeting, had received a letter from President Samuel Sheldon, stating that he heartily agreed with the rule now so generally adopted and favored by a large majority in the society, to limit the term of the president to one year, and accordingly he should decline a nomination for a second year.

Chicago Convention of the National Electric Light Association.

(*By Telegraph.*)

THE twenty-sixth convention of the National Electric Light Association opened in Chicago on Tuesday morning with nearly five hundred members and guests registered. The session was called to order promptly and opened with the presentation of resolutions that had been passed by the Chicago City Council, welcoming the Association, and the reading of letters from Edison, Brush, Thomson and others, expressing regret at inability to be present. President Ferguson then delivered his address, which was referred to a special committee for action concerning important recommendations made. The report of the Committee on Progress was next read and accepted without discussion.

The report by Chairman W. M. Anthony, of the Committee on Office Methods and Accounting gave rise to a most lively and interesting discussion in which Messrs. Doherty, Insull, Ryan, Newman, Holmes, Scovill, Bemis, Carlton, Bean, Smith and many others took part. Mr. Insull pointed out that a proper system of central station accounting has a beneficial effect on the standing and the value of securities. He said that in the last year he had bought ten lighting properties, not one of which had a decent system of bookkeeping; the result was that some of the properties were acquired below their real value. An amusing discussion took place between Mr. Scovill and Prof. Bemis as to erroneous ideas propagated by theorists as to the low cost of current. Mr. Scovill said that such ideas did harm to the industry. Prof. Bean disclaimed any such intention and called Mr. Bean and others sharply to account for statements which opposed his views. The discussion also took up the matters of deposits on meters, the use of prepayment meters and weekly instead of monthly payments. Mr. Anthony urged that stations must be ready to meet all tastes and conditions like a lunch counter. Messrs. Williams and Gilchrist referred to the difficulty of obtaining a satisfactory prepayment meter and to the complications which its use involves. Mr. Gilchrist said that Chicago had a great number in use with satisfactory results. Mr. Peck testified to the excellent results from the use of the bookkeeping system recommended by Mr. Anthony. At the close of the discussion, the convention was invited to visit the new Edison turbine station on the following day.

The afternoon session was largely attended and opened with the reading by Mr. Hosmer of a paper by Mr. Charles L. Edgar, of Boston, on the "Advantages derived from the use of one system of generation and transmission of electrical energy from all power stations in one locality." Mr. Junkersfeld pointed out that the policy in Chicago was similar to that carried out in Boston. Mr. John W. Lieb discussed questions relating to reliability of operation, touched on double busses and said that a storage battery equipment is essential in a central station. Mr. A. Bement then read his paper on "Boiler and Furnace Efficiencies." In the discussion Mr. W. L. Abbott dwelt upon the importance of securing efficiency in the boiler room, and pointed out that since boilers in central stations are only worked at their full capacity for short periods, their average efficiency is higher than the efficiency at full power. The paper was also discussed by Messrs. Lieb, King and Dow. Mr. John S. Peck then read a paper entitled "Standard Ratios for Transformers," which was discussed by Messrs. Moody, Wagner, Garland, Lieb, Carlton, Hewitt, Gille, Wirt and Lewis. Next came a paper by Mr. J. Henry Hallberg, of Cincinnati, on the "Application of Four-Ampere Series Enclosed Alternating Arc Lamps for Street Lighting," which gave rise to an interesting discussion participated in actively by Messrs. Ryan, Bertrand, Wirt, Williams, Lieb and Bean, the latter treating the subject in a humorous but none the less practical manner. Owing to the absence of Prof. Elihu Thomson, who was detained owing to a serious illness in his family, Mr. Ryan, of the General Electric Company, read the paper by Prof. Thomson, which was discussed by Messrs. Ryan, Wirt, Lieb and Bean. The afternoon session closed after a rejoinder by Mr. Hallberg to the discussion of his paper.

A group photograph of the attendants, numbering four or five hundred, was then taken outside the Art Institute. The first day's proceedings may be regarded as a great success. The meeting hall was uncomfortably warm, but there were always from one hundred to two hundred and fifty in the audience, and the proceedings were most interesting. By the close of the day almost six hundred names were registered, being a record for the association for a first day's attendance. President Ferguson made an excellent presiding officer, his attitude being firm, quiet and judicious. The programme of hospitalities offered by the Chicago Edison and others was most excellent, and was admirably carried out under the direction of Mr. James Wolff.

Under the experienced management of Mr. C. O. Baker, Jr., Master of Transportation, a special train was organized over the New York Central and the Michigan Central Railroads to run through from New York City to Chicago. It left about 1.15 on Sunday afternoon and arrived at 12.45 p. m. on Monday. But for an accident to the locomotive, even this high speed would have been beaten by an hour. But as it was the three-score members and friends were delighted not alone with the speed of the run, and the weather that attended it, but with the constant attention and courtesy shown by the officials of the two systems. Those who went off in detached squads from the East "missed it." At the end of the pleasant trip, just before reaching Chicago, a muster was called in the smoking car and hearty resolutions of appreciation of the good treatment received were noted unanimously. Whether the convention special is a thing of the past or not, as to crowds, it is certain that this one will hold its own with any in the past for fun and quiet good fellowship. On arrival, a large party of Chicagoans, headed by Past President Wilmerding, were at the depot with coaches to take everybody to their destined hotels.

A most enjoyable and enthusiastic reception was given on Monday evening by the electrical interests represented in Chicago, to the delegates, members and ladies attending the convention. It took place in the parlors of the Auditorium and was attended by several hundred people. Guests were received by President and Mrs. Ferguson and other members of the Entertainment Committee, and to enumerate the well-known representatives of electric light and power, in manufacturing and central station work, would fill a page. Music was given during the evening by an excellent band, and refreshments were served in the south parlor. This large room had been very tastefully decorated with the Elblight system, streamers of colored lamps and smilax, etc., hanging from the ceiling and walls, while spirals of lamps were also grouped on the tables. The sight was heartily applauded by all. After the collation, dancing began and was kept up until a late hour.

The Entertainment Committee comprised: James Wolff, chairman; J. W. Buell, B. E. Sunny, A. L. Tucker, Homer E. Niesz, W. W. Lowd and W. R. Pinckard.

The Reception Committee included the following well-known Chicagoans: B. E. Sunny, chairman; Samuel Insull, Edward B. Ellicott, Frank L. Perry, C. D. Crandall, Truman P. Gaylord, B. J. Arnold, Thomas I. Stacy, H. R. Hixson, F. E. Donohue, R. C. P. Holmes, F. B. Badt, G. H. Atkin, Francis Raymond, J. R. Wiley, A. D. Lundy, C. E. Gregory, George C. Bailey, F. W. Kohler, W. M. Smith, George B. Foster, M. B. Austin, W. S. Goll, C. H. Wilmerding.

PRESIDENTIAL ADDRESS.

In opening President Ferguson referred to the great increase in the membership of the Association, having advanced in one year more than 225 per cent., until now the active and associate membership list numbers 532 members, 452 of whom are active, and 80 associate, besides 26 honorary members.

The President of the Association, he said, should not be burdened by detail, but the office should be that of chief executive, whose duties consist in enlarging the scope and value of the Association's work and conserving the interests of its members by directing the forces at his command, rather than that of historian. The work of review should be done by one whose daily thought and activity are along the lines of watching the development of the art. Following this idea, he had appointed a "Progress Editor," who has covered in a very exhaustive and elaborate report the development of electricity in its application to light and power.

In addition to the standing committees already in existence at the last convention, there have been appointed during the year reporters on five special subjects, all of great importance to the members of the Association. These reporters have been actively engaged gathering information and suggestions from all the members, which they have assorted, sifted and compiled, and from which they have drawn certain conclusions which will be submitted to you as recommendations in the form of carefully prepared reports. The reports of these special committees are not merely perfunctory reports, but represent months of special and continuous thought, and will prove as valuable and interesting as the papers which have been prepared especially for the convention.

The "Question Box" has been made a special department, and an editor appointed to handle it. It has grown to such proportions it was deemed advisable to have the questions and answers printed completely for distribution at the convention, and if found desirable it will be discussed at one session of the meeting.

At the last convention there was considerable discussion on the subject of the relation between manufacturers and central station companies, and through the president taking up with the manufacturers' individual cases as they arose, it has been found that all the manufacturers are willing to co-operate to all reasonable extent. Much success has been met in handling several cases of unfair competition, and in no instance where the president's assistance was requested has he failed in protecting the interests of the member companies. Early in the year there was one notable case, where a member had obtained a franchise and city contract for lighting. After considerable effort the real basis of the opposition was traced, and by using the influence of the Association and its members, the manufacturers were induced to discontinue negotiations for the sale of machinery and the financial houses to reconsider their proposed support, resulting in a complete abandonment of the proposition, and leaving the field clear to the original company. The value of the Association to this member company in this one case would more than pay its dues for one hundred years.

The Committee on Standard Rules for Electrical Construction and Operation has been called upon for unusually active work in connection with the National Electrical Code. Certain changes in the rules for overhead construction had been proposed by a committee of the National Underwriters' Electrical Association, and were under consideration by a committee representing the American Institute of Electrical Engineers. Feeling that some of the proposed changes in the rules were impracticable, objectionable and unfair to the member companies of this Association, the president communicated with the president of the American Institute of Electrical Engineers, and urged postponement of favorable action on these changes until they might be considered by the National Electric Light Association. The request was granted, and the N. E. L. A. Committee on Standard Rules for Electrical Construction and Operation was invited to attend the future joint meetings of the Committees of the National Underwriters' Electrical Association and of the American Institute of Electrical Engineers. Two meetings were held in Boston, one in February and one in March, at both of which the committee and president of the Association were in attendance and took an active part. The committee took the position that no changes could be made in these rules without a meeting of the conference, consisting of representatives of all associations interested in the subject. This position, after considerable argument, was sustained, and as a result of the efforts of the committee of the Association, assisted by the committee from the American Institute of Electrical Engineers, the underwriters removed many of the objectionable features in the proposed changes of the rules.

The re-establishment of a conference—after an inactivity of five years or more—to finally settle all questions of rules of the National Electrical Code, is of prime importance to the central station companies of the country, and it will prevent the establishment of rules by the underwriters which might seriously injure the electrical interests of the country and retard the development of the industry.

The necessity for closer relations with other associations of kindred character was shown by the joint work of the Committees of the National Electric Light Association, and the Association of Edison Illuminating Companies, in the matter of the National Electrical Code. The American Institute of Electrical Engineers, whose membership is made up largely of purely technical men, may lay down some rules, or the National Bureau of Standards may adopt some standards of measurement which, while they may appear good from a purely scientific standpoint, may be exceedingly bad from a business standpoint of the members of this Association.

Some of the members of the Association are also members of the Association of Edison Illuminating Companies, and the various State gas and electric light associations throughout the country and the officers and engineers of the member companies are members of the American Institute of Electrical Engineers, and of the American Society of Mechanical Engineers, and other similar societies; consequently if the influence which it is possible for them to wield is brought to bear on any given subject affecting them, and under consideration by other bodies, there is no doubt that serious injury to the interests of the member companies of this Association may thereby be prevented. He recommended, therefore, the appointment of a small committee of forceful men to watch the movements of other kindred bodies and engineering societies, to confer with them from time to time, and to promote a closer relationship with them so their officials may not be antagonistic to the members of this Association.

Taking up the subject of the steam turbine, President Ferguson said that there is probably no piece of apparatus in the construction of the central station at the present time, the results of which are awaited with such keen interest by central station managers. When we stop to consider that two manufacturers of steam turbines in this country have taken orders in twelve months for approximately 540,000 hp capacity, one may reealize what an important factor it may ultimately become in the central station business. It seems wise, therefore, that a committee of three good mechanical engineers should be appointed to follow the development of the steam turbine during the coming year and report the results at the next convention.

There is a growing demand for electric power in factories, and it is important to central station companies that this business should be obtained for their service. Statistics showing the useful and economical application of electricity in factories, together with costs at various rates per kilowatt-hour, are not readily obtainable, and the appointment of a committee of three men from different sections of the country was recommended to gather statistics on "Purchased Electric Power in Factories," and report at the next convention, or sooner, if found feasible.

President Ferguson said that in choosing the papers for this convention, he had tried to touch upon each branch of the central station business treating of some phase of production, by-products, distribution, customers' apparatus, engineering and testing and management. It has been his intention to avoid confining the papers and reports entirely to purely technical subjects, and to treat with considerable liberality questions which might properly be classed under the management of the central station. Many of the subjects to be presented are entirely new to the Association, and have never been discussed before in its conventions.

In conclusion, President Ferguson thanked the gentlemen who had so kindly contributed papers, the editors and reporters of the various committees whose names appear on the programme, and the members of other active committees, who by their valued support have helped him to serve the interests of the members. He complimented the industrious and ever-watchful assistant secretary of the Association, who so ably handles the routine work, and expressed his appreciation of the aid of the electrical press.

REPORT OF THE COMMITTEE ON PROGRESS.

As chairman of the Committee on Progress, appointed for the first time this year, Mr. T. C. Martin presented a report of 69 pages,

which, besides an introduction, included such topics as gas and electricity; incandescent gas lighting; the statistical growth of the art; comparisons with abroad; the storage battery equipment; high-tension overhead transmission; new types of arc lamp; high-tension underground transmission; motors and electric drive; advances in electric heating; improvements in fuses; vacuum tube lighting methods of charging for current development of Nernst lighting; osmium incandescent lamps; the diffusion of light from arc lamps; a street electrolier competition; central station chemical work; the Cooper Hewitt static converter; cheaper production of current, including steam turbine data, and state laboratories. The report abounds in figures. As to its discussion of topics, the following as to electric heating will be of interest:

In discussing the subject of electric heating with central station men, the remark is still often heard that the cost of purchase and operation places it beyond the category of large sources of income; and the private customer also very often abstains from the use of such apparatus because of the fear that it will cost too much. There is a third party in interest, the manufacturer of such apparatus, who is fighting all the time for a lower kilowatt-hour price; and it is obvious that the lower the cost of current the greater will be the public patronage extended to any and every class of electrical service and appliance. I can well remember that cost of current was the burden of complaint in the early days of the motor, but to-day every intelligent manager is aiming to increase his motor load, and with concessions to the consumer that are doing much to build up that class of business. In the meantime, many a manager is having electric heat appliances put on his circuits without knowing much about it, so that the public often finds it convenient to pay for temporary heat the price of light. Paradoxical as it may sound, the crying demand is for heat in summer, which largely goes unsatisfied, and will remain a want until the electrical inventor and manager have solved the problems in a manner that will enable a woman to cook electrically as easily as she now throws a shawl over her shoulders, or permit a man to warm up his office as promptly as he can don a light overcoat.

At Somerville, Mass., recently, the central-station manager, in reconstructing, cut off circuits in resident sections a street at a time, from day to day, when light would not be required. His first experience was that he got five complaints from one street. The people had no current—and they must have it—because they could not use their flatirons. Yet the manager had not sold a single flatiron at that time and did not have the means of knowing that any were thus being operated. Mr. James I. Ayer, our worthy past president, now manager of the Simplex Electric Heating Company, informs me that he, also, knew of no such use specifically in Somerville. In this case we have an example of what must be going on all over the country, for Mr. Ayer states that they have made and sold over 60,000 flatirons, of which, in New York alone, we have, by the way, some 5,000. What is true of flatirons must be true of other appliances, for Mr. Ayer tells me that last year alone they disposed of about 1,000 chafing dishes; and I think it stands to reason that a great many of these must be operated on central-station circuits. Perhaps, as I have intimated, we are beginning to do more collectively than, as individual stations, we imagine to be the case. Seeking for information in this respect, I have learned from Mr. Ayer that their customers' index carries about 10,000 names, about 20 to 25 per cent. of which represent factories, hospitals and public institutions

It may still seem to some central station men that this is "picayune" business, but heating is apt to run up into the consumption of large volumes of current; and there is a growing inquiry for special work and equipments through central stations. In one instance, the recent supply of a 15-kw heater for an oil tank enabled the central station to get the motor business also by being able to take care of the other want. Mr. Ayer states that they have installations of as many as 50 electric glue pots operated on central-station current; and the number of such pots is already "way up" in the thousands. In this respect also, Mr. Max Loewenthal, engineer of the Prometheus Electric Company, informs me of three cases within the month of April where the settlement of important industrial heating questions enabled the stations to secure large contracts for current.

All this is encouraging, but I am free to confess my present dissatisfaction with the slowness of development in the domestic field as compared with gains in the industrial. If we assume hypothetical cases, it would seem that a great deal more could be done eyen now. Under a sliding scale of prices, whatever current is consumed for heating, cooking or laundry purposes, counts toward reducing the price for all the current used. It is easy to see that this tends at once toward economy. In fact, it is possible, if one takes an extreme case, almost to save money by adding an electric kitchen to the household. Let us assume that a flat contained 16 electric lamps, and that their total consumption was estimated at 800 watts an hour. Now let us also suppose that they actually consumed 47 kw a month, which would be just within the two-hour-a-day limit, and still subject them to the charge of 15 cents a kw. The monthly bill would be $7.05. Now, assume that an electric kitchen has been added which uses 3,300 watts a day. This would be 99 kw a month. If paid for at 15 cents a kw, the kitchen alone would cost $14.84 and the whole bill for current would be $21.89 for the month. As a matter of act, however, the total consumption of current would have amounted to 146 kw, or more than six times the hourly capacity of the lighting installation, and the whole bill would be at the rate of five cents a kw. The total charge would then be $7.30, or a cost of 25 cents only a month for the cooking. Unless there is something very much amiss with this calculation beyond my power of detection, such figures involve a revolution in domestic economy that we must come to sooner or later.

In respect to the advance of the Nernst lamp, the following figures are given:

I am sure that few new departures in the lighting art have been watched with more interest than the introduction of the Nernst lamp, the general elements and features of which are now so well known to members as to need no comment. At the worst, we have in this lamp a valuable addition to our resources in subduing the whole domain of lighting; at the best, we have a device which has apparently advantages over some earlier methods in certain respects, and which rounds out the central station efficiency. In view of the criticism leveled at the lamp from some quarters as to its economy, I have been surprised at its rapid advance, for there could be no more eloquent testimony as to its meeting a want than the fact that it has already, within little more than a year, been adopted by upwards of 1,000 central stations and isolated plants in this country.

The adoption by central stations of Nernst lamps is gradually being pursued in the same manner as with the incandescent lamp; that is, on the free-renewal system. The general result stated by Mr. Dunham, of Hartford, Conn., who has 4,000 Nernst lamps, is that he can produce the same illumination at a general cost of less than one-half that of incandescent lamps, everything considered, on account of the lesser consumption of energy necessary with the same central station equipment. Some of the larger installations for street lighting are at Hartford, Conn.; Unionville, Conn.; Rouse's Point, N. Y.; Annville and Sewickley, Pa.; Lincoln, Neb.; Madison, Wis., and Salt Lake City, Utah. In some cases it is the six-glower lamp that is being used for this purpose, comparing in energy and light with the ordinary 5.5-amp. enclosed-arc lamp. In other cases, it is the three-glower and quite often the single-glower is used. The latter is especially well adapted, as it gives a candle-power of 50 with less than 100 watts' consumption.

Another installation is on the college grounds at the city of Mechanicsburg, Pa., which is operated by the Cumberland Light, Heat and Power Company. The lamp is being extensively used in shops and factories, halls, lobbies, office buildings and the like, such as the Riter-Conley Manufacturing Company, Leetsdale, Pa.; the Lunkenheimer Company, Cincinnati; the various shops of the Westinghouse interests, viz.: Air Brake, Electric & Foundry; the Wellman-Seaver-Morgan Engineering Company; the Deering Division of the International Harvester Company; Deere & Co., Moline, Ill.; Williams, White & Co.; the Atlas Tack Company, Fair Haven, Mass., and Swift & Co., Fort Worth, Texas. It is quite extensively used in the yards of Armour & Co., Swift & Co., and the Union Stock Yards at Chicago.

For office work and drafting it is being found specially well adapted on account of the uniformity of quality and the absolute steadiness of light. The drafting rooms of the Union Station of the Pennsylvania Railroad, at Pittsburg, are completely equipped with Nernst lamps. The Farmers' Bank Building in the same city, which is the third largest structure of its kind in America, has two or three

thousand lamps, and this plant has been illustrated and described in the technical press. The John Hartness Brown Department Store in Cleveland, Ohio, which is the latest big store in that line, will be entirely equipped with Nernst lamps. Among special installations, there might be mentioned those of Barnum & Bailey and Ringling Brothers' circus, where a special and unique traveling plant has been devised for the illumination of the vast marquée or arena tent in which performances are given.

Mr. Calvin W. Rice, second vice-president of the Nernst Lamp Company, states that when compared with the carbon incandescent lamp the same light-giving power can replace clusters of incandescent lamps, and including the cost of maintenance, trimming, energy, etc., it can effect a saving of from 30 to 50 per cent. Of course, the question is a different one when we come to consider the demand for the smaller unit incandescent lamp of ordinary 16 cp.

REPORT ON OFFICE METHODS OF ACCOUNTING.

A most interesting and valuable report was presented by Mr. W. M. Anthony, comptroller of the Chicago Edison Company, on "Office Methods and Accounting," at the Tuesday morning session. It took the shape of two handsome pamphlets "printed and prepared for private circulation only." One of these contained the text of the report; the other embraced in fac-simile a number of the tables, forms, blanks, loose sheets, etc., used by the Chicago Edison system in the transaction of its enormous business. The textual report was also admirably illustrated by a number of half-tone cuts, of which one showed the interior of the accounting department of the Chicago Edison and Commonwealth Companies, and the separate application of the addressograph comptometer, arithmometer, bookkeeping typewriter, perforating receipt stamp, etc. Mr. Anthony remarked in the course of his report that: "The art of operating accounting consists in giving an air of distinction to insignificant but very important things in their inception; locking the door of knowledge before the horse of responsibility is gone"; and he then proceeded to discuss suggestions and devices brought to notice by members of the Association, but drew largely upon his own store of ripe experience. The chief topics thus taken up were "receipts and disbursements"; the "reading of meters"; "billing of current" and "use of customers' ledgers." Mr. Anthony discussed in detail and with excellent elucidation the points connected with loose sheet and card systems for receipts, the latter "card" method as applied to companies with about 1,000 customers. He remarked: "Some of the chief objections raised against the card system are its first cost, and the fact that the cards are liable to get lost or destroyed to cover up theft. But the experiences of the larger number of small companies shows that they have never lost a card, and they think that the value of the system is well worth its cost." Mr. Anthony then discussed minutely such topics as credits and collections, disbursements, purchases and invoices, accounts payable and voucher system. In regard to the necessity of conforming accounting details to the requirements of executive and operating officers, if feasible, Mr. Anthony said: "The bookkeeper who will 'fall off his perch' once in a while and take a peek at things as they are, through the eyes of the operating official will have his eyes opened to his own prospective advantage. This, perhaps, is a little digression, but it is wise to stir the animals up now and then, as it is depressing to stand on one leg too long." In conclusion, Mr. Anthony submitted a form of voucher record or register of disbursements, because it exemplified the widest scope of business activity, covering lighting, street railway, gas, express, heating, water power, etc.

BOILER AND FURNACE EFFICIENCIES.

Mr. A. Bement read a paper with this title, in which he gave the results of tests on two types of boilers, a single boiler of one type being tested and three boilers of a second type, one of the latter, however, having changes introduced making it practically a third type. The boilers had a standard rating of 400, 434 and 480 hp respectively, and were of the water tube type. The tests were so made as to separate the boiler and furnace efficiencies, the former term referring to the amount of heat abstracted by the boiler water surfaces from the gases. The paper is illustrated with a large number of curves, and contains tables giving the dimensions of the boilers and the data of tests.

To determine the boiler efficiencies the initial temperatures of the gases were taken at various points in the course of the gases to the flues. In one case 72 per cent. of the drop of temperature was shown to have occurred in the furnace and in the passage of the gases between the tubes of the boilers. In a comparative test between one boiler of each type, the efficiencies of the combined boilers and furnace were found to be 57.83 per cent. and 59.12 per cent. respectively, and the efficiencies of the boiler alone, 77.69 per cent. and 70.12 per cent. respectively. The paper discusses at length the bearing of all the data obtained, and shows how by certain changes the efficiency of one of the boilers was greatly increased.

STANDARD TRANSFORMER VOLTAGES.

In a paper with the above title, Mr. John S. Peck presented a plea for the adoption of standard transformer voltages. The employment of standard voltages means, he said, that the user shares in the advantages gained by the manufacturer, and the possession of transformers which may be used interchangeably on different parts of his circuits is an advantage easily appreciated. It means to him the necessity of carrying in stock fewer spare parts and the possibility of obtaining such parts much more quickly than when special ones are required. It means the ability to shift apparatus from one part of his system to another, and in general a great increase in the flexibility of a vital part of his equipment.

The Westinghouse Company has adopted for standards the voltages recommended by the A. I. E. E., with such additions as had been frequently demanded in commercial work. For varying these voltages over the desired range, the plan of bringing out taps from the winding was adopted. A table gives the voltages adopted as standard, as well as the variations which may be obtained. In all cases a value of 5 per cent. below normal, and two values, one 5 per cent. and one 10 per cent., above normal may be obtained. There is thus obtainable from any transformer, a total range of 15 per cent., which is found ample for almost every condition of service.

Where this series-multiple connection is demanded, the plan has been adopted of bringing out a tap from each half of the winding, so that 5 per cent. of the total winding is included between each tap and the outside terminal. With this arrangement the multiple connection gives a voltage 10 per cent. in excess of the normal, and the series connection, two voltages, one 5 per cent. and the other 10 per cent. in excess of the normal. Where the three two-phase connection is to be provided, each additional voltage means a large increase in the number of taps brought out, and therefore complication of terminal block. Where this connection is required, the transformer is provided with taps for increasing the normal voltage by 10 per cent. To standardize low-tension voltages, the same plan was adopted as for the high tension; that is, certain nominal values were selected and taps brought out for a suitable variation. For example, for a nominal voltage of 2,000, two taps are brought out so that the following voltages may be obtained: 2,200, 2,100, 2,000, 1,900. In many cases, however, low tension winding must be arranged for series-multiple connection, so that two secondary voltages may be obtained—for example, 200 and 400 volts. For this condition, the same arrangement as was described for the high tension is adopted, namely, a 10 per cent. tap is brought out from each half of the winding. For the 200-400 volt combination, the following values may be obtained: 300, 220, 400, 420, 440. For rotary converters, the voltage required varies with the number of phases of the rotary, and with the direct-current voltage which it supplies. With transformers for this service, an alternating-current voltage is selected which will give the required direct-current voltage. This is considered the normal, and taps are brought out to give values approximately 5 per cent, higher and 5 per cent. and 10 per cent. lower than normal.

FOUR-AMPERE SERIES ALTERNATING CURRENT, ENCLOSED ARC LAMPS FOR STREET LIGHTING.

In a paper with the title "The Application of Four-Ampere Series Alternating, Enclosed Arc Lamps for City Lighting," Mr. J. Henry Hallberg sketched the history of street lighting, and then gave an account of the system employed in Cincinnati. In that city the council specified four-ampere alternating current, enclosed arc lamps for the streets, alleys and suburbs. The paper includes numerous illustrations of the manner in which the lamps are installed, and gives an account of the generating station, where switching and regulating apparatus for 100,000 lamps and 90 automatic constant-current, 60-light transformers are installed. The entire system is operated from a 4,500-volt, 60-cycle, 3-phase generator. Four thousand five

hundred arc lamps are in circuit. The paper discusses the subjects of carbon life, trimming, globes, underground cables, power factor, etc.

The conclusions of the author, based on his experience with the installation during the past year are as follows:

First, the open-base inner globe is safer and more economical than the closed-base globe. Second, the large metal reflector is not necessary on four-ampere series alternating-current lamps hung only 12 or 15 feet above the street, but a small enamel reflector immediately above the arc is beneficial. Third, the initial or natural power factor of a four-ampere series alternating-current system should not be depended upon to be greater than 75 per cent., varying between 70 and 75 per cent. Fourth, the 75-per cent. power factor applies to ordinary overhead circuits. When the current is supplied underground in lead-covered cables, the capacity of such cables introduces leading currents, hence the operating power factor of the underground circuits at Cincinnati is maintained above 90 per cent. Fifth, the efficiency can be maintained above 91 per cent. and the regulation still be perfect. Sixth, four amperes is the lowest practical limit at which successful alternating-current arc lighting can be practised. Seventh, half-inch diameter carbon is the most practical size to use in a four-ampere alternating-current lamp. Eighth, notwithstanding the large size of the carbon (considering the low-energy arc), the regulation of the system is perfect, and there are no objectionable shadows from the carbons. Ninth, it requires only eight trimmers to take care of 4,500 lamps. Tenth, the outages or lamps requiring starting in the underground district are less than one-fourth of one per cent., and in the overhead district the outages average one per cent.

CURRENT NEWS AND NOTES.

FERRARIS STATUE.—A statue to the late Prof. Galileo Ferraris was unveiled at Turin, Italy, May 17.

THE MANILA CABLE.—A dispatch from Manila, dated May 25, states that the cable steamship *Anglia* anchored the Manila end of the Pacific cable on the beach on that day and started to pay it out to Guam, the next station.

LECTURE ON RADIUM.—Mr. William J. Hammer gave a lecture on "Radium and Radio-Active Substances" at the thirty-fourth annual meeting of the New Jersey State Microscopical Society, held in the Ballantine Gymnasium, Rutgers College, New Brunswick, N. J., Monday evening, May 25.

INDEPENDENT TELEPHONE CONVENTION.—The annual convention of the National Independent Telephone Association is to be held, as announced by us last week, on June 24 and 25, at Chicago. Mr. J. B. Ware, of Buffalo, the secretary, informs us that an interesting programme is in preparation, which will soon be ready for publication, and which exceed any previous one in importance to the art and industry.

NATIONAL ELECTRICAL CODE.—The 1903 edition of the National Electrical Code, which has just been issued, contains 107 pages, an increase of 27 pages since 1901. No notice is given of the new matter added nor any indication of changes. It would appear very desirable that this information should be contained in some prefatory pages, in order that the contractor might know, without a close reading of the entire text, whether new requirements bear on his methods of installation.

MARCONI IN DRAMA.—According to a London dispatch, Mrs. Langtry, the actress, proposes to produce a drama in which the Marconi wireless telegraph system will form an important part. The information was given out in the wireless telegraph paper printed on board of the American Line steamer *Philadelphia* on her last trip from New York to Southampton. The climax of the proposed play will be a scene on an ocean liner, on which the villainy of the villain and the heroism of the hero will be established by wireless telegraph messages from Nantucket.

LIGHT FROM WASTE.—So successful have been the experiments of Commissioner Woodbury of the New York Street Cleaning Department in using street refuse for fuel, that he has decided to establish plants for the production of electric power. He will manufacture "briquettes" from the refuse by using a bituminous flux. He announced last week that from the 800,000 cubic yards of refuse yearly disposed of by the city, power can be generated each day capable of lighting 7,272 lamps of 2,000 cp. "There will be no more dumping at sea," said the Commissioner. "Hereafter the city will use all refuse for fuel. The city can sell power and make money, instead of selling the refuse. I have put in an order for flux to make the briquettes. We have already a plant or crematory running in West Forty-seventh Street and I intend to ask the Board of Estimate to let me erect another." Major Woodbury said it would be possible to supply fuel to the proposed city lighting plant.

LETTER TO THE EDITORS.

The Mechanical Cause of Gravitation.

To the Editors of Electrical World and Engineer:

SIRS:—I quite agree with your correspondent, Mr. Townsend Wolcott, that *under the conditions he has described,* the helicoidal motion of the water particles is more or less an illusion; and the illusion is apt to be explained in the way he explains it. That is one of the reasons which has tended to switch off scientists from a true scientific investigation, because such an explanation is in accordance with the accepted theory.

But if Mr. Wolcott or any reader will use the apparatus I have described in the issue of May 16th, and instead of using water, will use compressed air of sufficient pressure to project a two-inch lead ball from the rotating nozzle with a longitudinal velocity of at least 100 ft. per second, they will not only see, but can also photograph the elliptical orbit produced.

Or, if any readers have the facilities necessary to enable the experiment to be carried out vertically upwards in an empty elevator shaft 12 ft. square, and 150 ft. high, where calico screens can be stretched across the shaft at each floor, I shall be very pleased to assist them with the experiment whilst I am in the city. As I am only here on a visit, and have no acquaintances who have the facilities, I hope some of your truth-loving readers will take this matter up.

It is fifteen years since I carried out the experiments at my ranch in California, and since that have in my spare time been trying to find a scientific explanation, and trying to trace out the application of the new laws of motion into realms of natural philosophy, which when the facts are known and accepted, will produce the most profound revolution in dynamical science the world has ever known.

And now I wish others to know the truth as I have found it, because it will not only save scientists the unutterable anguish of feeling that they are powerless under the present system of being able to explain natural phenomena, as their intuition tells them it ought to be explained. But it will also lead to many commercial inventions, by establishing true mechanical causes in place of uniform antecedents or illusions. From over twenty years' study of this subject, I am prepared to prove the following four propositions:

First Proposition.—That Galileo was mistaken by his projectile experiments in formulating the parabolic law of falling bodies, and in establishing the principle of the independent superposition of longitudinal and transverse momenta. Because he imagined that a body such as a stone when raised from the ground and let go, actually falls back to the ground; whereas the falling is only an illusion, and I will prove by experiment that it is only an illusion, and that the true cause is a resultant motion of the earth, spinning on its axis whilst describing a helicoidal trajectory in space. The body only obeys Newton's first law of motion, not his law of attraction, which is a fallacy so far as the *cause* of the motion is concerned.

Second Proposition.—I will prove experimentally, and by physical and mathematical reasoning, that Newton was likewise mistaken in his supposed proof of the parallelogram of forces. And I will prove that a curve, not a diagonal straight line, is the true resultant when two momenta are compounded transversely; and I will likewise prove that there is no force lost in the composition. And that proof will supply mankind with the long-lost key to the enigma of the universe.

Third Proposition.—I will also prove that Newton's second law of motion is wrong in two of the three cases given by him in the "Principia," and paraphrased by Kelvin and Tait in their great classic, when dealing with that law.

Fourth Proposition.—That Euler was mistaken in a similar way when he formulated his celebrated doctrine of the "Independence of translation and rotation."

But I wish to deal with one error at a time, and the first one is that of orbital motion, shown by the rotating nozzle and one ball. I wish to have that fact confirmed by some of your readers. That experiment will not only show how gravity is produced mechanically, without the attraction of matter; but it will show that the motion cannot be explained by the laws of motion now being taught at the universities. I have requested the leading scientists at the principal Eastern universities to check my experiments as the demonstration proceeds, but as some have tried to throw ridicule on the subject, I have been forced to appeal to a wider range of scientists, through the wide circulation of your valuable journal, with the earnest hope of receiving the recognition necessary to settle this matter definitely. I shall be glad to reply to any letters on the subject addressed to me, at 99 John Street, New York, care Institute of Mining Engineers.

New York. Robert Stevenson.

DIGEST
OF
CURRENT ELECTRICAL LITERATURE.

Dynamos, Motors and Transformers.

Power Factor of Three-Phase Motors for any Wave Form.—Dina.—A mathematical article. The difference of the e.m.f. curve of a three-phase motor, from a pure sine wave, is generally small, as in it the 3rd, 9th, etc., overtones are missing, while in the current curve the other harmonics are dampened by self-induction. Nevertheless, it is not proper to assume from the first that the error due to the assumption of pure sine curves for the e.m.f. and current waves, is negligible in practice. He investigates the dependence of the power factor of a three-phase motor upon the wave form and arrives at the result which is approximately true, that the value of the power factor, as found by the tangent formula, is greater than the true value by as many per cent. as the effective value of the voltage curve is greater than the effective value of the fundamental wave.—*Zeit. f. Elek.*, May 7.

REFERENCES.

Induction Motors with Commutator Armatures.—Alexander and Fleischmann.—The first part of an article in which the authors give a theory of induction motors with direct-current armatures provided with a commutator, such as the Heyland motor. The purpose of the article is to explain the action of such motors by developing their known properties from a new point of view.—*Zeit. f. Elek.*, May 10.

Motor-Starting Switches.—Broadbent.—Critical notes on some remarks in a recent paper by Bate on motor starting switches.—Lond. *Elec. Rev.*, May 8.

Power.

Electric Power in Mines.—Schneider.—An article on electric installations in various mines in Germany. In Westphalia there are several mines with electric plants up to 1,000 hp. In a new mine in Silesia a power plant of 5,600 hp will be installed, consisting of eight three-phase generating sets, each of 700 hp. Some researches are mentioned on the utilization of blast furnace gases in gas engines. The engines have been greatly improved during the past years; difficulties due to the non-uniform composition of the blast furnace gases, their impurities and their relatively small caloric value, have been partly overcome; and there is no doubt that there is a great future for the blast furnace gas engine. Many coal mines are in an even better position than blast furnace works, because they have a gas which is more suitable for gas engine operation than the blast furnace gas. The coke ovens, even when by-products are obtained, give a gas volume which is greater than that required for heating the furnaces. The quantity of this surplus gas varies between 11 and 40 per cent., and therefore averages 25 per cent. "The caloric value of the gases also varies between 3,500 to 4,500 calories, and therefore averages 4,000 calories." If these numbers are assumed as a basis, a battery of 50 furnaces gives a surplus of 520 cubic metres of gas per hour, which when burned under boilers give about 300 hp, but when used in gas engines about 655 hp. In the coal mine region of Westphalia about 100,000 hp are thus available. Several such plants are now installed in Germany.—*Zeit. f. Elektrochemie*, April 16.

Power Transmission in Greece.—An illustrated description of the first three-phase transmission plant in Greece. Numerous waters are collected and discharged through a tunnel in the mountains; between the tunnel exit and the level of the lake there is an average fall of between 8 and 9 metres, and there the power house has been erected. There are two turbine-driven, 130-kw, 5,000-hp, three-phase generators and the current is transmitted over a 13-km line to the pumping station which consumes the main part of the power. It contains two 80-hp induction motors, direct-coupled to two centrifugal pumps. It is intended to furthermore use the electric power for the agricultural development of the load, and incidentally for the lighting of offices and driving small machines.—Lond. *Elec. Rev.*, May 8.

Mersey Railway.—An article, illustrated by maps, on the "electrification" of the Mersey Railway. The contractors were the British Westinghouse Company, who carried on the conversion successfully without interruption of the regular steam service, which was no easy task, considering that the trains were carrying about 10,000,000 passengers per year. Weeks before the new line was opened, the electric trains were running between the scheduled steam trains, in order to put the whole system to a test under working conditions. The electric service was definitely introduced on May 2. A technical description is promised for a later issue.—Lond. *Elec.*, May 8.

Noiseless Railway Crossings.—A description of an experiment being tried in St. Louis, in which wooden blocks are used for the crossings of the rails. In one pattern a wearing plate of steel is laid on the wooden block; this is the plan which it is thought will be most desirable, and is illustrated in the engraving.—*St. R'y Jour.*, May 9.

New Emergency Line Wagon.—A description of a wagon which was built for one of the Massachusetts roads. In summer it is used as an emergency wagon and in winter as a snow plow. The tower is raised by a windlass; inside the car is a reel large enough to hold 1 mile of trolley wire. The car has a portable pneumatic crane, which can operate from either side of the car, for lifting in and out heavy appliances.—*St. R'y Jour.*, May 9.

REFERENCES.

Cars for the Yerkes Underground Railways.—The first shipment of electric cars for the Metropolitan District Railway Company, which is now operated by steam, in London, has been received. This line will use a double metallic circuit, the third rail being about 16 in. outside of the wheel rail and 3 in. above it; the return rail is in the center of the track, 1½ in. above the wheel rail. Each train will be made up of seven cars, three of which are motor cars and four trailers. The cars will be heated by electricity.—*St. R'y Jour.*, May 9.

Du Bois.—An article on improvements in the Du Bois Traction System. This town has a population of 12,500 and the company operates both the railway and the lighting systems. The company has 11 cars, 100 arc lamps, 6,500 incandescent lamps and several stationary motors.—*St. R'y Jour.*, May 9.

Installations, Systems and Appliances.

Distribution Losses and Resonance Effects.—The conclusions of a detailed account of the discussion of the paper by Constable and Fawsett on distribution losses in electric supply systems and of Field's paper on a study of the phenomenon of resonance in electric

circuits by the aid of oscillograms; also an editorial summary of the principal results of this extended discussion. There exists now a fairly definite idea what is the order of magnitude of the dielectric hysteresis loss plus eddy-current loss in a modern cable; in the vast majority of cases it is not serious enough to impair greatly the efficiency of a supply system. Should at any time an engineer want to lay a ten-mile, 10,000-volt, three-phase cable merely for supplying electrical energy to a town with a maximum demand of 300 kw and a load factor of 12 per cent., there will be serious losses in the high-tension main if it is of the ordinary type; but such a case would be very unusual. Cable manufacturers should, however, investigate more closely the dielectric hysteresis and eddy-current losses in their cables. From the discussion of Field's paper the conclusion is drawn that proper main charging appliances are a necessity, and an auxiliary discharger in the guise of a lightning protector is not to be despised. Sparks advises not to "run up" on the mains by increasing the speed of the alternator, but to do so by running the alternator up to the standard frequency before switching on, and to raise the voltage by increasing the excitation.—Lond. *Elec.*, May 8.

ELECTRO-PHYSICS AND MAGNETISM.

A Penetrating Radiation from the Earth's Surface.—RUTHERFORD AND COOKE.—A Phys. Soc'y paper referring to an observation of Rutherford that the radiations from the naturally radioaction bodies and also the excited radiations, include some rays of an extremely penetrating character, which are able to pass through great thicknesses of matter. Since the excited activity obtained from the atmosphere is very similar in character to the excited radiations from thorium and radium, it was thought possible that some penetrating rays might be given off from the surface of the earth and walls and rooms on which excited activity from the air is distributed. This view was confirmed by experiments in which he found that about 30 per cent. of the ionization inside a closed vessel is due to an external radiation of great penetrating power. This radiation appears to come equally from all directions and is probably due to excited activity from the surface of the room in which the observations were made.—*Phys. Rev.*, March.

Electric Conductivity of Atmospheric Air.—MCLENNAN AND BURTON.—An account of some experiments on the electric conductivity of atmospheric air. From experiments of previous investigators it seems probable that the earth's surface, and possibly, too, the materials used in the construction of the apparatus used for such experiments, are sources of emanation. The authors have made a series of observations upon atmospheric air confined in air-tight vessels of different metals. The result of the investigations showed that the conductivity of the enclosed air depends very largely upon the material of which the receiver was made, and the effects observed would seem to indicate that all metals in varying degree are the sources of a marked though feeble radioaction emanation.—*Phys. Rev.*, March.

Lagrange's Equations and Electric Currents.—DAY.—A note presented to the Am. Phys. Soc., on the problem taken up by Maxwell, of applying Lagrange's equations of motion to the phenomena of electric currents. In treating this problem Maxwell found that the question arises whether a wire would experience a sudden impulse in the direction of its length, when a current was suddenly started or suddenly stopped in the wire; he stated that no evidence of the existence of such a term has ever been discovered. The present author shows that starting from the same basis, one may ask another question, namely whether a wire would experience an impulsive torque when a current was suddenly started or stopped in it. He made an experiment in this direction, but could not find that such an effect exists.—*Phys. Rev.*, March.

Coherer.—TAYLOR.—An account of a long series of experiments with the coherer in which he reaches the following conclusions: The coherer may give either of two distinct types of curves, depending upon the applied voltage, the amount of ballasting resistance, the strength of the current, the amount of oxidation of the contacts, and the influence of electrical disturbances. When in a condition to give one of these typical curves, the coherer is most sensitive, and will show either positive or negative coherer action to very nearly the same degree. The coherer is easily sensitive to changes of contact distance of the order of a ten-millionth of an inch, as well as to electrical and mechanical disturbances of exceedingly small magnitude. The order of distance to which the coherer is quite sensitive, shows that the single-contact coherer really has no practical existence; what has been called a single-contact coherer is in reality a coherer of many contacts. On account of the variable potential, and consequent variable electrostatic attraction, it is not likely that the distance and voltage curves represent very closely the true relations between those two quantities. Still, these curves show considerable similarity, and in accordance with the assumption of many parallel pairs of contact elements, they show a variable rate of increase of voltage with distance, the curve getting steeper as the contacts are pulled apart, and fewer contacts come into play. The theory of the coherer is far from complete and there is no theory which satisfactorily explains all the different phases of coherer action. The author explains many of the coherer phenomena on the basis of the assumption of parallel elements of contact surface.—*Phys. Rev.*, April.

Hysteresis.—GUYE AND HERZFELD.—An account of an investigation made to determine whether the hysteresis loss per cycle depends on the frequency; the result is negative, the loss being found to be constant up to a frequency of 1,200 cycles per second.—*Comptes Rendus*, April 20.

Magnetic Effect of Electric Convection.—CREMIEU AND PENDER.—An account of the final results of a joint investigation made by the two authors, who had formerly arrived at opposite results in independent researches. The present result is in favor of Maxwell's theory and the probable error which caused Cremieu's previous negative results, is shown.— *Comptes Rendus*, April 20.

REFERENCES.

Pressure Due to Radiation.—NICHOLS AND HULL.—An abstract of an Amer. Phy. Soc'y paper in which they give an account of more recent and more accurate measurements of radiation pressure in comparison with measurements of radiant energy. The results are in agreement with the Maxwell-Bartols theory to within about 1 per cent. A demonstration of the effect of radiation pressure upon the torsion balance used in the experiments, was made before the society. —*Phys. Rev.*, March.

Magnetic Moment.—BECK.—A description of some experiments on the effects of certain mechanical changes upon the magnetic moment of a bar magnet. The effects of bending, twisting and concussion are discussed and the results are given in tables and diagrams. —*Phys. Rev.*, April.

ELECTRO-CHEMISTRY AND BATTERIES.

Electrochemistry in the United States.—HABER.—The first part of a report to the German Bunsen Society for Applied Chemistry on the industrial development of electrochemistry in this country and on the methods of teaching electrochemistry in our universities. He points out the differences in the industrial development in the European countries where the old type of culture exists and in a new country like the United States. In the former an increase of wealth of the nation depends upon larger refinement of engineering skill and upon progress of scientific knowledge; it is a development "in depth" rather than "in breadth." The latter is the characteristic feature of the new country which applies to the achievements of the older countries to the utilization of undeveloped wealth. He believes that the period of the general influence of Germany on the chemical industrial development in the United States has now about passed, and the branches of inorganic chemistry in the United States have become or are becoming independent. Metallurgy has long become independent, and in the size of plants, the development of machinery and the output of metals, it has generally surpassed Europe. The American manufacturer does not consider research work as a necessary supplement to the regular operation of his plant, while the German manufacturer generally employs a certain number of chemists who do research work, the results of which are not felt by immediate improvement of the income of the factory, but only by possible results, hoped for in the future. He discusses at length the study of electrochemistry and of physical chemistry in American universities, and gives a general comparison of American and German universities; the student entering a university in the United States has had by far less scientific education than in Germany. On the other hand, in American boys a certain technical intuitive power is developed to a remarkable and much greater degree than in German boys; in this respect the workshops in high schools, manual training schools, and universities, have an important in-

fluence. From the German point of view, the education in chemistry in American universities appears "superficial and practical." From the American point of view, the education in chemistry in German universities appears "thorough and impractical." He emphasizes the importance of physical chemistry to the inorganic chemist; as it is not a special branch of chemistry, it presents the only general method by which the chemist should think. He then discusses the industrial development of electrochemistry in the United States. California is not yet "ripe" for electrochemical industries, although there are good prospects for electrolytic copper refining in the northern part of the State and for the electrolytic mining of tin from scrap tin in the southern part; as the price of zinc is high, the precipitation of gold from cyanide solutions by means of the electric current also appears promising. It would be wrong to assume that the enormous developoment of the industries and engineering in general in the United States has been due to water power developments; the increase of steam power has been much greater since 1870 than the development of water power. Concerning the cost of generating electrical energy by steam power, he states among other things that the cost of the electric horse-power hour, produced by steam power, is about 1 to 1.25 cent for a greatly varying load curve and discontinuous operation, but that for absolutely continuous operation with uniform load the cost is much smaller, and may be as low as 0.25 cent per horse-power hour. Canada is even richer than the United States in water powers which can be cheaply developed. He gives data concerning the amount of power used by the different electrochemical concerns in Niagara. He thinks that for the power used in the two plants of the Pittsburg Reduction Company, 15,500 hp is nearer the truth than 10,500, as given by Dr. J. W. Richards; the company itself declines to give the exact figure. He gives descriptions of the processes used by the Union Carbide Company and the Pittsburg Reduction Company, at Niagara; the manufacture of ferro-chronium by the Wilson Aluminum Company, in Kanawha Falls, W. Va., the manufacture of silicon copper by the Cowles Electric Smelting & Aluminum Company in Lockport; and the Acker process in operation at Niagara. The success of the Acker process is said to be technically perhaps the most unexpected; the voltage is higher than in other process, but the current efficiency is better than in any other known process for alkali and chlorine. The durability of the apparatus is said to be fully satisfactory, and if this be found to be the case in the future, the process would have all chances of becoming the standard one on account of its simplicity and elegance if there was not the high power consumption. In any case the success is to be considered as a remarkable technical achievement.—*Zeit. f. Elektrochemie,* April 16, 30.

Action of Hydrochloric Acid in Various Solvents upon Metals.—PATTEN.—A paper in which he first refers to the opinion, often expressed that there cannot be any chemical action except between ions, and that the presence of water or moisture is an essential condition for enabling a chemical action to go on. Kahlenberg, however, has shown that the oleates of copper, nickel and cobalt dissolve in benzine to form non-conducting solutions and that dry hydrochloric acid gas precipitates instantly the chlorides of these metals; he also found similar and analagous reaction. To further study the action of chemicals upon each other in solutions in which the conduction of electricity is extremely slight, the present author has dissolved gaseous hydrochloric acid in various solvents and brought the resulting solutions into contact with a number of metals and carbonates. From this it appears that the presence of water is not a necessity in order that chemicals may react upon each other; a chemical system need not conduct electricity electrolytically in order that chemical action takes place. There is an interesting appendix to this paper, referring to a statement of Remsen that he had been unable to get hydrogen by acting upon dry zinc with hydrogen chloride dissolved in dry benzine; this is in contradiction with Kahlenberg's results; the present author shows that Remsen's failure was due to the fact that moisture was not excluded in his experiments. Kahlenberg's results are confirmed.—*Jour. Phys. Chem.,* March.

Electrolysis of Water.—WHITNEY.—A paper referring to the recent investigation of Bigelow on the continual electrolysis of water at voltages below the decomposition value. He thinks that a strict application of the Nernst formula for e.m.f. of polarization would explain all the phenomena observed and described by him without the necessity of introducing any new corpuscular hypothesis. Whenever a very small e.m.f. is applied, too small for visible electrolysis, there immediately occurs at least such an amount of real electrolysis as is capable of changing the poles into electrodes whose characteristic e.m.f. is equal and opposite to the impressed e.m.f. The earliest experiments on polarization point to this as a fact. In the case of an aqueous solution, the gases when dissolved in the electrolyte are capable of depolarizing the electrodes, especially the hydrogen; the oxygen electrode and a current at very low voltage seems a necessary result, which should depend largely on diffusion and convection, as the actually studied current evidently does. The quantity factor of the electrical energy necessary to decompose the water is the constant of Faraday's law, but the intensity factor by which this must be multiplied to give the energy necessary, is the e.m.f. of polarization. This, in accord with the Helmholtz-Nernst conceptions, is a function of the concentration at the active electrodes. He claims that Bigelow's experiments support this view.—*Jour. Phys. Chem.,* March.

The Disintegration of the Anode.—WOHLWILL.—A very long paper on the phenomena of the disintegration of the anode. The formation of the anode slime in electrolytic refining is mainly due to the non-uniform composition of the anode, but even when an absolutely pure and uniform copper anode is used in pure sulphuric acid, there is a formation of a fine red powder on the anode, which he claims must be a precipitate from the electrolyte. He gives a long list of facts which support his theory.—*Zeit. f. Elektrochemie,* April 23.

REFERENCES.

Electrolytic Oxidation of Aromatic Compounds.—SEBOR.—An account of some experiments in which he investigated the conditions under which aromatic compounds can be oxidized electrolytically. A high current density should be used, but the current is nevertheless small.—*Zeit. f. Elektrochemie,* April 30.

The Dissociation Constant and Identity and Purity of Organic Compounds.—SCUDDER.—An account of a long investigation of the reliability of the dissociation constant as a means of determining the identity and purity of organic compounds. He concludes that it is a moderately reliable aid to identification, but its use is limited.—*Jour. Phys. Chem.,* April.

UNITS, MEASUREMENTS AND INSTRUMENTS.

Damped Ballistic Galvanometer.—STEWART.—A paper in which the author states that the theory of the ballistic galvanometer as usually presented assumes either that there is over damping or that it is small. Consequently there is a general impression that a well-damped ballistic galvanometer cannot be used to measure or to compare quantities of electricity; yet it has been shown experimentally that such a galvanometer can be used; when used in determinations of magnetic induction no appreciable errors have been detected. The author gives a mathematical theory of the damped ballistic galvanometer and shows that the throw in a galvanometer whose motion is aperiodic, is directly proportional to the quantity of electricity, and, therefore, conforms to the general rule of undamped ballistic galvanometers. This result is obtained under the assumption that the damping force is directly proportional to the velocity; if the damping is due to induced currents, no matter where, this is strictly true; in the case of air damping it is approximately true. He also assumes that the force of restitution is proportional to the angular deflection. This for the movable needle type is true only for small deflections, but for the d'Arsonval galvanometer, it is not so restricted. He shows that in an aperiodic d'Arsonval galvanometer the throw is approximately independent of the moment of torsion of the suspension strips. This is of some practical importance, as it often happens that in low-resistance galvanometers of this type, the suspension strips have as great and sometimes greater resistance than the coil itself. When this galvanometer is intended for ballistic work with an earth inductor or in electromagnetic experiments when the damping is necessarily great, the galvanometer being used on closed circuit, a considerable gain may be had by not making the strips so small. In a well-damped galvanometer the principal agent in overcoming the velocity imparted to the needle and thus limiting the throw, is not the earth's field or the torsion of the suspension, but the damping. The author concludes that in all the determinations of magnetization curves and hysteresis loops by the ballistic method, a great deal of time may be saved by using as the ballistic galvanometer an ammeter without its shunt or a voltmeter without its series resistance.—*Phys. Rev.,* March.

Use of Meters.—An abstract of the report of a committee, appointed by the Professional Syndicate of Electric Stations, on the use of meters in the systems of French central stations. The report gives a summary of the replies receive to inquiries sent to the different central stations. For direct current, motor meters are universally used. The meters are tested at different intervals by the different stations, these intervals varying between one month and two years; in some stations they are tested only upon a complaint of a customer. The replies received concerning starting and exactness were rather uniform; they indicate that a meter starts at about one-fiftieth of its normal power and that the accuracy is about one-twentieth of this power. The use of the O. K. (O'Keenan) meter is less general than that of the Thomson meter; but the former seems to be considered to be more sensitive. Concerning alternating-current meters, less replies were received. The following types are in use: Batault, Blathy, Japy and that of the Creil Company. The meters are said to register the wattless current at a power factor above 0.6 to 0.8; some are said to be exact for a power factor of 0.3. They are practically independent of the variations of e.m.f., and of the wave form. Nothing is said on the influence of the frequency.—*L'Ind. Elec.*, April 25.

Measuring Very Low Resistances.—RENNIE.—A communication in which he comments on a method recently described and in use in the German Reichsanstalt for comparing very low resistances, and which he thinks is too complicated. He is of the opinion that a more promising method for this important class of measurement will be found on the lines of the differential galvanometer method. The present form of the Cranley arrangement has shown itself amply capable of giving results to 1 in 10,000, while an accuracy of 1 in 1,000 is easily obtained. It is, therefore, thought that it is in the direction indicated by the differential galvanometer that progress is to be sought.—Lond. *Elec.*, May 1.

REFERENCES.

Electric Micrometer.—SHAW.—A detailed illustrated description of an electric micrometer for laboratory use. It reads in units of 0.001 mm or 1 micron, the error being, under favorable conditions, not more than ½ micron. The scale is very long, the range being from 1 to 40,000 microns or more. The applicability of the instrument to various measurements is described.—*Phys. Rev.*, March.

TELEGRAPHY, TELEPHONY AND SIGNALS.

Wireless Telegraphy at the Sea Coast.—SHARMAN.—A communication in which he points out that there is at the present time a large and very useful field for the immediate application of wireless signalling over moderate distances for the prevention of wrecks along the seacoast. He remarks that the "effective range" of a wireless telegraphy station varies from time to time even when the utmost care is taken to eliminate all instrumental irregularities; apparently it depends upon certain obscure atmospheric conditions. While the Morse alphabet is useful in all signalling operations, he prefers another system for the purpose of preventing wrecks; he proposes to install the apparatus on a dangerous island or headland; some simple combination of impulses is taken to serve as a code abbreviation for the name of the danger point, for instance by the letter *i*, represented by two dots; these are transmitted automatically at the commencement of every minute by the action of a cam operated by clockwork; automatically the transmitter is connected first to a vertical wire of great length, representing transmission over a zone of five miles, then to a shorter air wire, representing transmission over a zone of three miles, and then to a still shorter air wire, for transmission over only one mile. When a ship is within five miles near the danger point, it receives the letter *i*, once at the commencement of a minute, while it receives it twice or three times, when at a distance of three miles or one mile respectively. In this system the dot combination (or letter) indicates the name of the danger point, and the number of times this combination is received at the commencement of each minute, indicates the approximate distance from the ship to the danger point. The manner in which the character of the signals change as the ship continues her course, serve to show whether she is going towards or away from the danger point.—Lond. *Elec.*, May 8.

REFERENCE.

Wireless Telegraphy and the Army.—PRASCH.—An illustrated article on the applications of wireless telegraphy to the uses of the army.—*Zeit. f. Elek.*, May 3.

MISCELLANEOUS.

Separation of Metals by Electrostatic Means.—NEGRESNO.—A description of an experiment in which he connects a horizontal metallic disc to the positive pole of a Wimshurst machine, and the plate from which it was cut, to the negative pole. If a mixture of sand and finely divided metal is dusted upon them the sand is deposited chiefly upon the disc and the metal on the other plate. The method may be useful in the separation of metals from their ores, and also in the separation of two mixed metals; in a mixture of powdered brass and copper, for instance, the brass is repelled and deposited on the upper disc.—*Comptes Rendus*, April 20; abstracted in Lond. *Elec.*, May 8.

American Physical Society.—The minutes of all meetings of this society and abstracts of the papers read before it will hereafter be published in the *Phys. Rev.;* the publication of the bulletin of the society has been discontinued. An account of the Washington meeting held December 31, 1902, and January 1, 1903, is given in *Phys. Rev.*, March.

REFERENCE.

Engineering Education.—DALBY.—A paper read before the British Inst. Mech. Eng. on the education of engineers in America, Germany and Switzerland.—Lond. *Elec.*, May 1.

Biographical.—BENJAMIN.—An account, with portrait, of the life and work of Alexander Graham Bell.—*Sc. Am.*, May 2.

New Books.

FINANCES OF GAS AND ELECTRICITY MANUFACTURING ENTERPRISES. By W. D. Marks, Philadelphia, Pa. 125 pp. Price, $1.

The author of this very entertaining and instructive little volume is well known as an engineer and central station manager. He has drawn largely upon his own experience, but has chosen to present some of the data in a rather unusual controversial form, which, to say the least, compels attention. The aim of the book is to show how much ought to be charged by a plant for gas and electricity to make the enterprise profitable, and this question opens up many others relative to the design of the plant and features of operation. Not only is data given with regard to one large city, but Prof. Marks discusses small lighting and railway enterprises from the standpoint of a searching analysis of all the conditions involved, and illuminates his subject very effectively. Even those who may not agree with his processes of reasoning can learn a good deal from his general and searching treatment of the subject. We are glad to note his insistence on a full allowance for depreciation, and may also signalize as worthy of study his remarks on meters and his commendation of hot water or exhaust steam auxiliary business. The dollar spent by any central station man for this pithy little book is well invested.

ANNUAL REPORT OF THE BOARD OF REGENTS OF THE SMITHSONIAN INSTITUTE, 1901. Washington: Government Printing Office. 782 pages, illustrated.

The most interesting section of the Smithsonian Annual Report for the year ending June 30, 1901, is an account of the history to date of the Smithsonian Inistitution, accompanied by a number of well-engraved portraits. The reading of this, however, gives rise to a doubt if the purpose of the founder, "the increase and diffusion of knowledge," has been so served as to exert any considerable influence in advancing knowledge. At the time when the policy of the Institution was fixed it might have appeared that great good could be accomplished by the publication of original memoirs and their free distribution to important libraries throughout the world; in the giving of popular lectures in Washington, their publication and distribution to libraries and individuals; in the stimulation of scientific work by providing apparatus, and by making grants of money to worthy investigators; and in the co-operation with government departments in advancing work useful to the general government.

At the present day, however, it would seem that any aid that may be given by the Smithsonian Institution to any of these objects has become superfluous. Original contributions to knowledge can now be made through channels which lead to more immediate and wider publicity among those directly interested than through the occasional memoirs of the Smithsonian Institution—an advantage that cannot be balanced by the free gift of the latter publications. We

are not aware of any popular lectures that have been given in Washington which have had an iota of the influence, for example, of those given before the Royal Institution of London and similar bodies. The magnificent equipment of modern universities, and, above all, the splendid Carnegie grant, furnish facilities for original investigation that minimize this function of the Institution; and the government scientific departments as now organized could doubtless be efficiently conducted without aid from the Institution.

In looking over the list of publications of the Smithsonian Institute during the year ending June 30, 1901, we find only a reference to a "Smithsonian Contribution to Knowledge," namely, a memoir on experiments on ionized air by Dr. Carl Barus, which is stated to be in the hands of the printer. In the "Miscellaneous Collections" there are noted a Bibliography of Chemistry; a paper by Langley and Very, entitled, "The Cheapest Form of Light"; a list of observatories, and two volumes comprising documents relative to the origin and history of the Smithsonian Institute, containing altogether 1983 pages. The other publications, aside from official reports, are reprints of articles from Smithsonian Annual Reports, the articles themselves being in almost every case belated reprints from other sources; and finally a number of publications of government departments issued under supervision of the Smithsonian Institution.

The present annual volume comprises, aside from the report of the secretary, about 600 pages, containing about three score articles which, with very few exceptions, are reprints of articles that appeared in 1901. Among these are a number on physical subjects, as follows: A reprint of a Royal Institution paper by Prof. Poynting, entitled, "Recent Studies in Gravitation"; a reprint from the *Phylosophical Magazine* of a paper by Lord Kelvin on "Ether and Gravitation through Infinite Space"; a reprint from the *Popular Science Monthly* of an article by Prof. J. J. Thomson, entitled, "On Bodies Smaller than Atoms"; a reprint from the *Revue des Deux Mondes* of an article by A. Dastre, entitled, "The New Radiations: Cathode Rays and Röntgen Rays"; a reprint from the *Proceedings* of the Royal Institution of a paper by Marconi on "Wireless Telegraphy"; a reprint from *Everybody's Magazine* of the article by Prof. W. A. Anthony on "Transatlantic Telephoning"; a reprint from the *Transactions* of the American Institute of Electrical Engineers of the paper by Mr. W. J. Hammer on the "Telephonograph"; a reprint from the *Popular Science Monthly* of a paper by Prof. Glazebrook on "The Aims of the National Physical Laboratory of Great Britain"; a reprint of a paper read by Walter Hough before one of the 1900 Paris congresses, entitled, "The Development of Illumination"; a paper read by Prof. S. P. Langley read before the Philosophical Society of Washington, entitled, "The Laws of Nature"; and an address, reprinted from a Johns Hopkins University *Circular*, by Prof. Mendenhall in commemoration of Prof. Henry A. Rowland.

As with scarcely an exception the papers above mentioned, as well as most others in the Annual dealing with other branches of science, received wide publicity at the time of their delivery in publications much more accessible than the Smithsonian Annual, to reprint them in the latter two or more years later appears to involve a waste of effort.

HOW TO BECOME A COMPETENT MOTORMAN. By Virgil B. Livermore and James Williams. New York: D. Van Nostrand Company. 232 pages, illustrated. Price, $1.00.

This is one of the practical volumes and deals with the electric street car motor in much the same fashion that the numerous catechisms on the locomotive deal with that form of prime mover. In many respects, to use a trite expression, the book fills "a long-felt want," for there is very little literature that the would-be motorman can obtain as a guide to the practice of his art. To meet this deficiency, the prominent electric railway companies are establishing schools for the training of motormen, and while it is impossible for any written presentation to compare with ocular and practical instruction, this little volume forms a handy memorandum, will supplement demonstrations, and become a valuable pocket companion.

The book is divided into a series of sections that hardly have the continuity of chapters. These sections deal with the various methods of street car control, and minutely describe the operation of the controllers and other pieces of apparatus for manipulating electric cars. This portion occupies about one-third of the volume. Then comes a very exhaustive and complete set of rules concisely setting forth the best method of procedure under all of the emergencies of which the authors can conceive.

Finally, the volume gives diagrams showing the circuits and paths of current, through all the best forms of controllers, under all circumstances. The book then concludes with a catechistic set of questions and answers relating to the operation of electric cars. The fact that the authors are practical men, who have written from a standpoint of the front platform, lends authority to the work.

BOOKS RECEIVED.

LA TRACTION ELECTRIQUE: Tramways, Locomotives et Metropolitains Electriques. Par Paul Dupuy. Paris: C. Naud. 495 pages, 264 ill. Price, 12 francs.

Directory of Electrical Societies, Etc.

AMERICAN ELECTROCHEMICAL SOCIETY. Secretary, C. J. Reed, 929 Chestnut Street, Philadelphia, Pa.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Secretary, Ralph W. Pope, 95 Liberty Street, New York. General meeting, Niagara Falls, June 29, July 3. Programme printed elsewhere in this issue.

AMERICAN ORDER OF STEAM ENGINEERS. Secretary, Frank C. Rose, 10 Federal Street, Pittsburg, Pa.

AMERICAN STREET RAILWAY ASSOCIATION. Secretary, T. C. Penington, 2020 State Street, Chicago. Next meeting, Saratoga Springs, N. Y., September 2, 3 and 4, 1903.

ASSOCIATION OF EDISON ILLUMINATING COMPANIES. Secretary, W. H. Johnson, Philadelphia, Pa.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS. Secretary, P. W. Drew, Colby and Abbott Building, Milwaukee, Wis.

CANADIAN ELECTRICAL ASSOCIATION. Secretary, C. H. Mortimer, Toronto, Ont. Next meeting, Toronto, Ont., 1903.

ELECTRICAL CONTRACTORS' ASSOCIATION OF NEW YORK STATE. Secretary, Wm. J. Davis, Ithaca, N. Y.

THE ELECTRICAL TRADES SOCIETY (Member National Electrical Trades Association). Secretary, A. P. Eckert, 39 Cortlandt Street, New York. Board of Directors meets every second Friday of each month.

ENGINE BUILDERS' ASSOCIATION. F. P. Ide, Springfield, Ill., Secretary.

INTERNATIONAL ASSOCIATION OF MUNICIPAL ELECTRICIANS. Secretary, Frank P. Foster, Corning, N. Y. ext meeting, Atlantic City, N. J., September 2, 3 and 4, 1903.

INTERSTATE INDEPENDENT TELEPHONE ASSOCIATION. Secretary, E. M. Coleman, Louisville, Ky.

NATIONAL ELECTRIC LIGHT ASSOCIATION. Secretary, James B. Cahoon, 136 Liberty Street, New York.

NEW YORK ELECTRICAL SOCIETY. Secretary, G. H. Guy, 104 Liberty Street, New York.

NORTHWESTERN ELECTRICAL ASSOCIATION. Secretary, T. R. Mercein, 85 Michigan Street, Milwaukee, Wis.

SOUTHERN INDIANA TELEPHONE ASSOCIATION. Secretary, E. W. Pichardt, Huntingburg, Ind.

Weston Employees' Club.

On the evening of May 22 the Weston Electrical Instrument Company tendered an inauguration reception to the Weston Employees' Club, the occasion being the formal opening of the new club rooms at the company's plant at Waverly Park, Newark, N. J. There were about 1,000 gentlemen and ladies present, and the affair was marked with cordiality and good-fellowship throughout.

The evening's entertainment consisted of some excellent instrumental and vocal music followed by a dance which lasted well into the early hours of Saturday. An elaborate banquet was served at midnight. Towards the end of the musical programme Mr. Edward Weston, president of the company, made an address in

which he dwelt upon the importance of establishing closer relations and a better understanding between officers and employees of industrial concerns. "Very often," he said, "the employers and employees are at odds because no effort is made by either to understand the other. With a view to bringing these two interests of his company into closer contact and thus promote harmonious relations between them, the Weston Company had encouraged and aided the employees in forming and establishing this club. He explained, however, that it was not wise for the manufacturer to go outside of his business to take up matters belonging to the worker. This fact led to the adoption of a plan whereby the administration of the affairs of the club would be entirely in the hands of the members themselves, the company providing the rooms and retaining only its building rights.

Mr. A. O. Benecke, chief electrician of the company, in behalf of the employees, thanked Mr. Weston for his interest in their behalf and assured him that the feeling was reciprocated. In closing his remarks, he presented Mr. Weston with a massive silver loving cup as a token of the esteem with which he is held by the employees.

Mr. Weston found it difficult to control his emotions when he arose to receive the gift. After expressing his thanks, he gave an interesting account of the company's development from its beginning to the present time, and concluded by paying a compliment to the skill of American engineers and workmen in successfully solving the many difficulties encountered in the development of the company's products, which are now used in every civilized country on the face of the globe.

For club purposes the company has provided two entire floors of a large four-story brick building. The floors are 200 ft. long x 38 ft. wide, and are completely furnished and equipped for their special uses. The dining room has a seating capacity for 300 persons, where it is proposed to furnish meals to the employee-members at just sufficient profit over actual cost to keep the club running.

The dining room on the occasion of the reception contained three long rows of tables, running its entire length, with a break here and there. Along the center of each row of tables was laid an Elblight lamp, with vari-colored lamps, and at the breaks in the long tables the strips were carried over the gaps in the form of an arch, sufficiently high to permit a person to pass under. When the current was turned on the effect was very pretty. This hall, as well as the reception and dancing hall, was decorated with festoons of Elblight streamers and profusely draped with flags and banners. The electrical decorations of the side rooms, which were temporarily utilized as part of the banquet hall, were particularly effective. In the center of the tables were large bouquets of artificial flowers studded with electric lights which gave a warm glow to the surroundings.

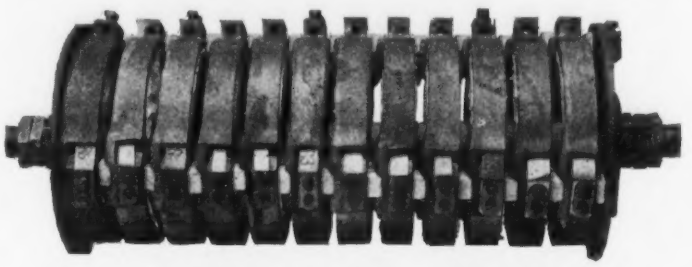
One of the features of the club's quarters is the bathing pool, said to be the largest indoor bath in the country. It is 150 ft. long and about 15 ft. wide. It is fitted up in the most approved manner.

Ferro-Manganese Plant in Canada.

A bill has been agreed to by the Legislature of New Brunswick to incorporate the Electro-Manganese Company, with a capital of $1,500,000, and power to increase this capital to $10,000,000. The incorporators are Barton E. Kingman, New York; Fred. C. Sayles and Robert S. Sayles, Providence, R. I.; Harry McLaughlin, New York, and Mattew W. Lodge, of Moncton, N. B. They propose to reduce wad, or bog ores, which abound in the Province of New Brunswick, and from these ores obtain ferro-manganese and spiegeleisen, with the ultimate idea of establishing a steel plant. They have a process of reducing the ores by electricity, and claim that for the first time it has been found this can be done on a commercial basis, but a great water power and a large electric plant are required. For this purpose, therefore, they wish to be granted by the government the use of the immense water power at the Grand Falls, on the St. John River, where they will erect a big plant. The company, it is stated, has concluded arrangements for establishing at Shawinigan Falls, Que., works for the production, on a large scale, of ferro-manganese. The contract calls for the delivery to the company by the Shawinigan Water & Power Company, of electrical power to the amount of 5,000 hp. The necessary plant will be installed at once, and to facilitate the operations of the company during the construction of permanent works, a temporary arrangement has been made with the Shawinigan Carbide Company, to operate in a part of the latter company's buildings. This will allow the Manganese Company to begin production in July next. The initial installation will employ 1,200 hp, and the output will be sold to manufacturers of steel, both in Canada and the United States.

Ventilated Cell Diverter.

The "Ventilated Cell Diverters" manufactured by the Westinghouse Electric & Manufacturing Company are designed to express the latest and best ideas in this form of electrical apparatus, answering the demands for capacity, insulation, durability and economy of cost, while maintaining good mechanical design and features. The individual cells are separated, permitting a free circulation of air around each cell, and may easily be renewed if injured or worn

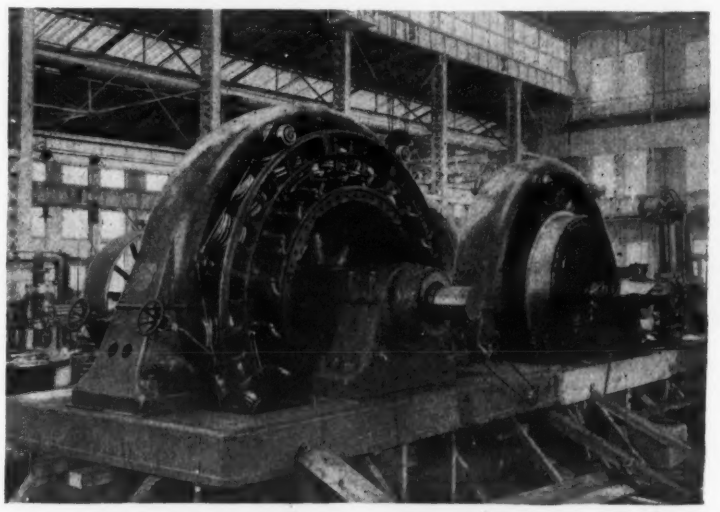


VENTILATED CELL DIVERTER.

out. Solid insulating blocks are placed between the cells, and solid insulating washers under the nuts at the ends of the columns. The end of the resistance strip is brought out through a slot in the cell casting and connected to a boss by means of a washer and two screws, giving the contact great permanency and rendering it unaffected by long exposure to severe climatic conditions. The whole apparatus is both compact and durable, arranged in several units for convenience in mounting, and adapted for all kinds of outdoor service, no material of either a hygroscopic or a combustible nature being used in the construction.

Bullock Generators for Massena.

The accompanying illustration shows two 2,250-kw direct-current generators now being built by the Bullock Electric Manufacturing Company for the Pittsburg Reduction Company and are to be in-



GENERATOR FOR MASSENA.

stalled at Massena, N. Y. Four machines of this size and type are being made for this company. They have double commutators and are to be driven by water wheels. They will operate at 140 r.p.m. and develop 500 volts. In the tests made, the machines were speeded up to 280 revolutions and at this speed the commutators had a peripheral speed of 7,500 ft. per minute. Notwithstanding this severe test, no faults were developed.

A New Telephone Receiver.

The Holtzer-Cabot Electric Company, of Boston, Mass., is placing upon the market a new telephone receiver, views of the parts of which are shown in Fig. 1. The shell is made in two parts, the body of the shell and the cap. Following the latest practice, binding posts have been discarded. The terminals are entirely enclosed inside the shell, making a perfect electrical connection and doing away with the danger of the user receiving a shock, while the cord, which is in all cases supplied with the receiver, is given a substantial hitch about the yoke of the magnet in such a way that no strain can come on the connections. Thus the life of the cord is greatly extended, while the work of renewing the cord is very slight.

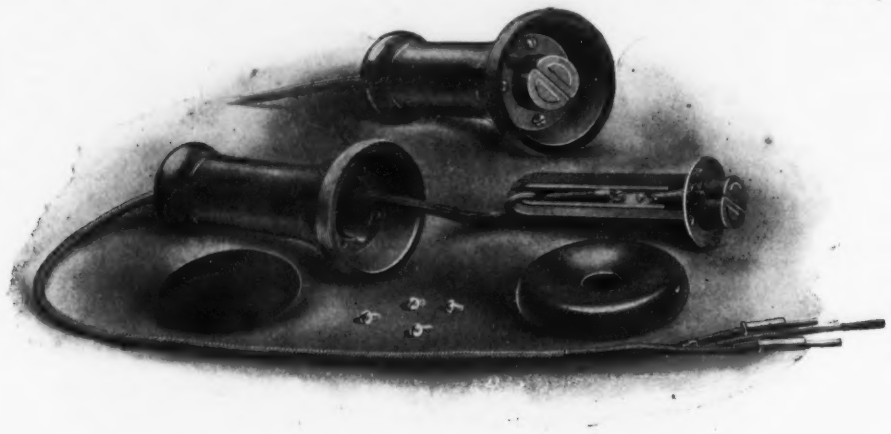
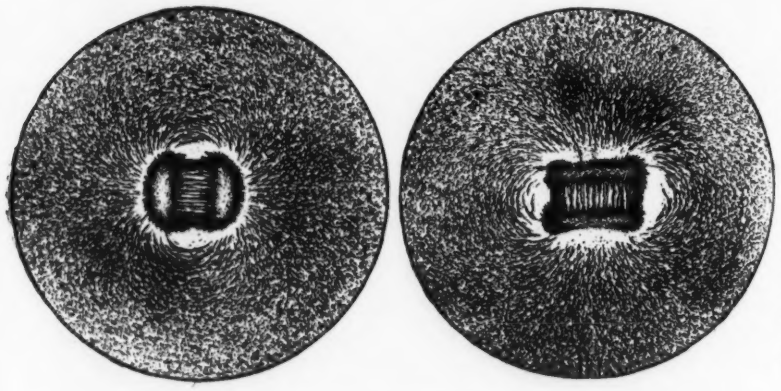


FIG. 1.—RECEIVER DISSEMBLED.

The permanent magnets are of a special grade of magnet steel while the pole pieces are of the softest Norway iron. It will be observed that the construction is bipolar. The pole pieces being semi-circular in section, give a more efficient distribution of the magnetic lines than is possible in a receiver in which the section of the pole pieces is rectangular. This point is well brought out in Figs. 2 and 3. These diagrams were made by covering thin diaphragms with iron filings and holding them over the poles of the magnets. By gently tapping the diaphragm the iron filings were caused to arrange themselves in position showing the direction and intensity of the magnetic lines in the region of the pole pieces. Fig. 3 shows the arrangement of the distribution in a field in which the pole pieces are rectangular and Fig. 2 in which they are semi-circular.

The adjustment feature has been omitted entirely and the receivers are permanently adjusted before leaving the factory. This is claimed a distinct advance in receiver construction; only one adjustment is necessary and this should be made by the manufacturers.



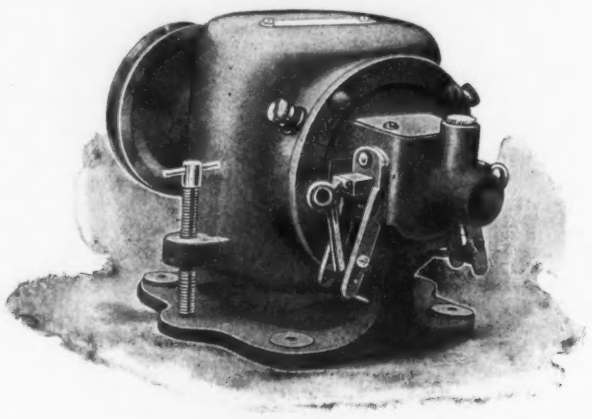
FIGS. 2 AND 3.—MAGNETIC SPECTRA.

The magnets are wound with silk-covered magnet wire, and corrosion is prevented by nickel plating all exposed parts. In connection with the unusually strong magnet a heavy diaphragm is used, making an extremely sensitive instrument and one that will respond perfectly through a wide range of conditions of transmission. These instruments are carefully standardized and are made with tools, jigs, etc., so that all parts are interchangeable. The receiver is made with either pure hard rubber or composition shell.

Gas Engine Igniting Apparatus.

The accompanying illustration shows a new form of gas engine igniter, which it is claimed to posses a great many advantages over other forms, among them being the use of a device for tightening the belt by means of which the dynamo can be rocked in either direction or held rigidly in position. This consists essentially of a cradle casting in which the dynamo is suspended and two thumb screws which enable the dynamo to be rocked in either direction to tighten or loosen the belt as the case may be. It will be noticed that the brush-holders are readily accessible and may be removed from the dynamo by simply pulling out the brush-holder fingers. It is not necessary to remove any screws in so doing.

The dynamo proper is entirely enclosed and is both water and dust-proof. There is no joint in the magnetic circuit, the entire machine being cast in one piece with the exception of the front bearing, which is removable. The commutator is of copper insulated with mica. The brushes are of carbon of rectangular cross section, and may be slipped into the holders from the outside by pulling back the brush-holder fingers. Access to the commutator is had through a small opening directly above it which is closed by means of a brass cover plate. The speed of this igniter is 1,200 r.p.m. This igniter is being put on the market by the Carlisle & Finch Company, Cincinnati, Ohio.



GAS ENGINE IGNITER.

Extensive Electrical Equipment for North German Lloyd Docks.

Considerable electrical equipment is now being installed in the new North German Lloyd docks at Hoboken, N. J. Ten electric hoisting engines are already in use on one section of the docks just completed and twenty more are to be used on the other two sections now under construction. The hoists just installed consist of four double-drum outfits of 40-hp capacity each, operated by General Electric motors. They are to be used for handling coal. Six 27-hp single-drum double-winch machines, also operated by General Electric motors, are also in use for handling cargo. The hoists were built by the Lidgerwood Manufacturing Company. Each machine is protected by a circuit-breaker located on the machine and also by an additional switch located on the ceiling. All operate at 500 volts. This is the most extensive electrically-driven hoisting equipment so far installed in American docks.

Ten electric elevators for passenger and baggage use are also being put in. They will be driven by 25-hp motors built by the General Electric Company. The elevator contract was secured by the Otis Elevator Company.

For the purpose of lighting the docks, 500 6½-amp. arc lamps and 500 incandescents of 16 cp are to be used. The lamps will be supplied by the United Electric Company of New Jersey, which at present furnishes energy for lighting and operating the machinery on the docks. The wiring contract has been allotted to E. A. Brennan & Co., Hoboken.

Ultimately the North German Lloyd Company intends to build its own plant for generating current for dock work. The capacity of the plant will be about 1,000 hp. W. F. Whittemore, 1 Newark Street, Hoboken, N. J., is consulting engineer for the North German Lloyd Company.

NEWS OF THE WEEK.

Financial Intelligence.

THE WEEK IN WALL STREET.—There was a good demand for money and a fairly liberal supply, the closing rates being 3½ a 4 per cent. for 60 to 90 days, and 4 a 5 per cent. for four to eight months. On the stock market there was a slump of prices in the middle of the week, due to fears of trouble to speculative interests arising from the manipulation of cotton and the severe breaks in Canadian stocks. This was, however, followed by a rally and renewed strength. The market did not fail to notice the further reduction in iron prices and the continuance of unsettled conditions in the labor situation. Among the industrials, the United States Steel securities took the lead and there was more or less liquidation in both common and preferred on the further decline of iron prices and the fact that the bond issue plan has proved to be a qualified success, only $150,000,000 of preferred stock, including the $80,000,000 to be supplied by the syndicate, having been tendered for exchange. Amalgamated Copper was steady in the face of the decline of the general market, but was not prominent in the trading. Tractions were weak and closed at the lowest figures, Brooklyn Rapid Transit losing 1½ points net, and Metropolitan ⅝, the closing quotations being 62½ and 129 respectively. General Electric dropped to 182½ but recovered, closing at 183¾, this being a net loss of 1½ points. Westinghouse rights sold between 7⅛ and 7, the latter being the closing quotation. Western Union was weak and dropped from 84¼ to 83, which was the closing price, being a net loss of 1½ points. American District Telegraph lost 3 points, closing at 30. The following are the closing quotations of May 26:

NEW YORK.

	May 19.	May 26		May 19.	May 26
American Tel. & Cable	78	75	General Electric	185¼	183⅜
American Tel. & Tel	154	153	Hudson River Tel	..	..
American Dist. Tel	30	29	Metropolitan St. Ry	130	129¾
Brooklyn Rapid Transit	64¼	61⅝	N. E. Elec. Veh. Trns	..	..
Commercial Cable	..	..	N. Y. & N. J. Tel	..	..
Electric Boat	20	20	N. Y. E. V. T. Co	7	6¼
Electric Boat pfd	40	39	Tel. & Tel. Co. Am	..	..
Electric Lead Reduction	1¼	1¼	Western Union Tel	84	82¾
Electric Vehicle	9	8⅛	Westinghouse com	196	190
Electric Vehicle pfd	15	13⅛	Westinghouse pfd	196	190

BOSTON.

	May 19.	May 26		May 19.	May 26
American Tel. & Tel	154⅜	154¼	Western Tel. & Tel. pfd	95	95
Cumberland Telephone	..	..	Mexican Telephone	1⅞	1⅝
Edison Elec. Illum	..	..	New England Telephone	137*	136*
General Electric	..	..	Westinghouse	97	94
Western Tel. & Tel	19	17⅝	Westinghouse pfd	98	94

PHILADELPHIA.

	May 19.	May 26		May 19.	May 26
American Railways	..	..	Phila. Traction	96¾	96½
Elec. Storage Battery	74*	74*	Phila. Electric	6½	6¾
Elec. Storage Battery pfd	74*	74*	Pa. Electric Vehicle	..	..
Elec. Co. of America	8¾	8¾	Pa. Electric Vehicle pfd	..	..

CHICAGO.

	May 19.	May 26		May 19.	May 26
Central Union Tel	..	..	National Carbon pfd	95	95
Chicago Edison	..	..	Northwest Elev. com	..	..
Chicago City Ry	205	200½	Union Traction	4⅛	3½
Chicago Tel. Co	..	..	Union Traction pfd	32	32½
National Carbon	24	23¾			

*Asked.

UNITED GAS IMPROVEMENT RUMORS.—The *Philadelphia Press* says of the rumored retirement of Mr. P. A. B. Widener from the United Gas Improvement Company: "Mr. Widener's retirement will mean another step toward the wide separation of the famous Widener-Elkins-Dolan syndicate, which is unquestionably the richest and most powerful aggregation of street railway men in America or the whole world. For years this coterie of millionaires has dominated the traction systems in Philadelphia, New York, Chicago, Pittsburg and Washington. It has for years been the ambition of Mr. Widener to have all the gas, electric lighting and street railway business of Philadelphia consolidated in one huge corporation. John M. Mack, who secured the rapid transit franchises, and who was largely interested in the electric light plants here, also favored that gigantic project. But Thomas Dolan opposed it most effectually. That caused some disagreement. Mr. Dolan refused to go on the rapid transit board. Widener and Mack then retired as directors from the Philadelphia Electric Company, and as Dolan's friends control United Gas Improvement, Widener's proposed retirement from the board of that company is a natural sequel to the campaign of differences. Dolan, Morgan and Bodine have gone ahead with gas and street railway enterprises all over this country. They own upward of forty corporations through the United Gas Improvement Company, which is regarded as a most successfully managed concern. Mr. Dolan prefers to keep this vast system of gas, electric and railway plans separate from other alliances."

JERSEY LIGHTING AND TROLLEY MERGER.—Official announcement is made that 86 per cent. of the entire outstanding stock of the five companies in the new $25,000,000 Public Service Corporation of New Jersey has been deposited in favor of the plan. The plan was declared operative a fortnight ago, and former Attorney-General McCarter, of New Jersey, who resigned to become president of the Public Service Corporation, is now ready to assume charge. The first act of the new company will be to issue $10,000,000 of stock for cash at par. It will reserve $15,000,000 for future requirements, to be issued at par and expended for betterments and extensions. This big consolidation of transportation and lighting companies in Passaic, Hudson, Bergen and Essex counties has as subsidiary companies the North Jersey City Street Ry. Co., Jersey City, Hoboken and Paterson Street Railway; Orange and Passaic Valley Railway; Elizabeth, Plainfield and Central Railroad Company, and the United Electric Company of New Jersey. For all these it will issue certificates aggregating $20,200,000. Negotiations are now pending for the leasing of the Essex and Hudson County Gas Company, Paterson and Passaic Gas and Electric Company, South Jersey Gas, Electric and Traction Company.

WESTINGHOUSE PROSPERITY.—It is noted from Pittsburg as a proof of the excellent future of electrical manufacturing that the business of the Westinghouse Electric & Manufacturing Company for last month was 160 per cent. greater than the company's business during April, 1902. With the $7,200,000 increased capital that the company will have from the sale of the $4,500,000 of stock to be issued at $80 there will be ample provision for a future continuance of the remarkable growth of the company's business shown by April's increase of 160 per cent. In investment circles there is a growing expectation that the electric company will follow the Westinghouse Air Brake Company's policy of the payment of extra dividends in addition to the 10 per cent. dividend basis already thought to have been decided upon. For some years the Air Brake dividends have been 2½ per cent. quarterly regularly and 3½ per cent. extra. The prediction, credited to Mr. Westinghouse, that electric will cross air brake is regarded as affording support for the expectation of extra dividends on electric before the year is out.

A DEAL BY THE UNITED GAS IMPROVEMENT.—Advices from Philadelphia state that the United Gas Improvement Company is engaged upon a deal involving the leasing of the American Light & Traction Company of New York with $40,000,000 capital. Negotiations have reached a point where auditors representing the gas company are examining the books of the other concern, and it will be upon the result of the examination that the terms of the lease will be negotiated. The question of terms has only been discussed informally, but it is understood that the controlling interests of the Light & Traction Company are willing to lease their property for an annual rental of 6 per cent. upon the entire capital. The Light & Traction Company, which was incorporated at Trenton on April 6, 1901, is a corporation similar to the United Gas Improvement Company, its object being to acquire control of other gas, electric and street railway companies, and to operate gas, electric light and power plants and street railways. While Philadelphia is not represented in the Board of Directors, a large amount of stock is held there.

KANSAS CITY CONSOLIDATION.—The conclusion of the transaction by which the recently formed $25,000,000 Kansas City Railway and Light Company takes over certain Kansas City properties was announced in Wall Street recently by the Equitable Trust Company, the depositary under the plan. The properties taken over were the Metropolitan Street Railway Company, of Kansas City, and the Kansas City Electric Light Company. The agreement provided for the exchange of 100 shares of the Metropolitan company for 100 of the preferred and 60 of the common of the new company, and 100 shares of the Kansas City Electric Light Company for 80 shares of preferred and 100 of common of the new company's stock. Under this, 32,140 shares of the railway and 18,414 shares of the electric light company stock have been deposited and exchanged. Interests connected with the transaction are understood to include the Armours, Blair & Co., and Kuhn, Loeb & Co.

CHICAGO TELEPHONE STOCK INCREASE.—The directors of the Chicago Telephone Company at a meeting on May 20 voted to issue $2,000,000 additional stock, which will raise the total outstanding to nearly $15,000,000, the full amount authorized. The new shares are to be offered at par to stockholders of record June 5. One-half of the amount must be paid in by July 1, and the remainder by October 1, and the company will allow interest at the rate of 5 per cent. on prepayments. This new issue will permit each stock-

holder to take one share for every six that stand in his name June 15. The proceeds of the new issue will be used in the extensions and improvements of the company's business in Chicago and the nearby cities in which it operates.

NEW WESTINGHOUSE STOCK.—With regard to the new issue of Westinghouse stock, a Pittsburg banker is quoted as follows: "At the price announced for the new Westinghouse Electric second assenting stock, $4,500,000 of which is to be issued at $80 per share, in the ratio of one new share for each four old ones, the rights on the basis of 105 would be worth but 6¼ per share. Buying the new stock at $80 would make the price of electric seconds to present holders on the basis of all their holdings, an even $100 per share. On the proposed 10 per cent. basis the stock is just a 5 per cent. payer, with the added attractiveness of the official statement of the directors that the company is earning over 20 per cent. on its outstanding capital."

RAILWAY CONSOLIDATION IN CLEVELAND.—The Cleveland Electric Railway Company, commonly called the "Big Consolidated," and the Cleveland City Railway, known as the "Little Consolidated," have agreed upon terms of consolidation. Both properties are to be taken over by a new company. The Big Consolidated has 136 miles of track and an authorized capital of $13,000,000 and the Little Consolidated 84 miles of track, with a capital of $9,000,000, of which $8,600,000 has been issued. The new company will probably be capitalized at $30,000,000. Senator Hanna will be the chairman of the Board of Directors. One of the immediate advantages of the consolidation will be the issuing of general transfers.

INDEPENDENT TELEPHONY.—Cleveland advices state that the stockholders of the Cuyahoga Telephone Company, one of the Everett-Moore syndicate properties, have voted to reduce the capital stock from $3,000,000 to $1,500,000 and to issue $1,500,000 preferred stock, the proceeds of which are to be used for extensions and improvements. From Canada it is stated that the thirty-million-dollar Merchants' Telephone Company will no longer confine itself to Montreal, but will establish connections through the Dominion in opposition to the Bell Company.

CONSOLIDATION IN COLUMBUS, OHIO.—The Columbus Railway & Light Company has been incorporated with $5,000,000 capital stock by W. P. Huntington, R. S. Warner, Emil Keiswater, E. R. Sharp and F. W. Prentiss. The company will lease the properties of the Columbus Railway Company and the Columbus Edison Company, guaranteeing stipulated dividends on the stock of the two companies. It is generally believed that the Columbus Gas Light & Heating Company will be leased under a similar arrangement.

BOSTON LIGHTING DEAL.—The Edison Electric Illuminating Company has purchased the electric light and power plants and business heretofore conducted by A. W. Perry under the name of the Church Green Electric Company, which has supplied light and power to customers in the shoe and leather district. The negotiations were conducted by Whitcomb, Wead & Co.

ELECTRIC STORAGE BATTERY.—Application has been made to the Stock Exchange to list $15,795,700 common stock of the Electric Storage Battery Company.

Commercial Intelligence.

THE WEEK IN TRADE.—In reviewing the general conditions the mercantile agencies note that while underlying conditions have improved as a whole, there is still room for betterment in weather, crop and labor matters. Retail trade has been stimulated by summer weather, but wholesale business halts pending further developments affecting fall trade. Collections have improved in a number of large cities. Railway earnings are as good as ever reported, the gross receipts for the first half of May indicating 14 per cent. increase over the same month last year, while the net returns for March show a significant increase of 16 per cent. on the corresponding increase in gross. The warmer weather has led to an almost magical change in reports from the South, and the cotton and corn crop there are coming on well with an unquestionable increase in the total acreage. Spring wheat reports are almost uniformly favorable and a bright prospect for fall trade exists in the Northwest. The labor situation is still a very mixed one and aggression by the men is being met by union among the employers. In the building trade at New York there is no improvement and the tie-up is quite general. Iron is drooping, largely because buyers are holding off on future purchases. Stocks do not accumulate, and consumers are insistent for deliveries on old orders. Steel is firm at the West, but resales of foreign steel at Eastern markets lead to an easier feeling in the market for billets. Finished products are in good demand. One of the less favorable situated trades is lumber, which shows the effect of building trade labor troubles. The copper market has been very quiet and a midsummer dullness prevailed throughout the week. Both producers and consumers continue to assume a waiting attitude, especially in view of the uncertainty of the labor situation. The ruling quotations are 14½ a 14¾c. for Lake; 14⅜ a 14½c. for electrolytic in ingots, cakes and wire bars; 14⅛ a 14¼c. in cathodes, and 14c. for casting stock. The United Metals Selling Company was reported on Friday to have advanced its prices to 15½c. for Lake and 15⅜c. for electrolytic copper. The business failures for the week ending May 21, as reported by *Bradstreet's*, numbered 155, against 182 the week previous, and 152 the corresponding week last year.

ALLIS-CHALMERS ENGINE SALES for April are shown partially in this list: City of Ely, Ely, Minn., one 14 and 28 x 36 cross-compound Reynolds Corliss engine; Mr. Charles Pope, Chicago, two 12 x 36 and 18 x 36 horizontal Reynolds Corliss engines; National Tube Company, McKeesport, Pa., three 46 and 86, 84 and 84 x 60 vertical steeple cross-compound furnace blowing engines; Carnegie Steel Company, Pittsburg, Pa., two pairs 44 and 84, 84 and 84 x 60 vertical standard disconnected compound blowing engines; National Steel Company, Pittsburg, Pa., two 50 and 96, 96 and 96 x 60 vertical steeple cross-compound furnace blowing engines; Morowebb Cotton Mill Company, Dallas, N. C., one 20 x 42 horizontal Reynolds Corliss engine; Smeeth's Copper & Bronze Company, Chicago, Ill., one 14 and 28 x 24 vertical cross-compound condensing direct-coupled engine; Wheeling Steel & Iron Company, Wheeling, W. Va., one 44 and 84 x 60 vertical standard blowing engine; Construction Company of America, New York City, two 20 and 40 x 42 horizontal cross-compound Reynolds Corliss engines; Grand Rapids Veneer Works, Grand Rapids, Mich., one 32 x 48 horizontal Reynolds Corliss engine; Munising Paper Company, Limited, Munising, Mich., two 20 x 36 horizontal Reynolds Corliss engines; American Steel & Wire Company, Shoenberger Works, Pittsburg, Pa., one 46 and 84 x 60 vertical standard long crosshead Bessemer blowing engine; one 80 and 84 x 60 vertical standard low-pressure furnace blowing engine; C. A. McDonald, Chicago, one 16 x 36 girder frame engine; Thomas A. Anderson & Co., Lancaster, Ohio, one 10 x 36 Reynolds Corliss engine; James M. Arnold, Chicago, one 16 x 36 Reynolds Corliss engine; El Oro Mining & Railway Company, Mexico, one 20 and 40 x 42 tandem-compound Reynolds Corliss engine; Harbison-Walker Company, Pittsburg, Pa., one 22 x 48 girder frame Reynolds Corliss engine; Valley Oil Mills, Memphis, Tenn., one 18 x 36 girder frame Reynolds Corliss engine; Wheeling Steel & Iron Company, Wheeling, W. Va., one 44 and 84 x 60 vertical standard blowing engine; Cunningham, Becheheimer Supply Company, Norborne, Mo., one 12 x 36 girder frame Reynolds Corliss engine; Larson & Greenough, Mullan, Idaho, one 10 x 30 girder frame Reynolds Corliss engine, and several other large orders are also noted.

WESTINGHOUSE ENGINE ORDERS.—Westinghouse, Church, Kerr & Co., Maritime Building, Bridge Street, New York, has taken a contract for a 400-hp compound engine for direct connection to a 300-kw generator for the American Waltham Watch Company's shops at Waltham, Mass. The outfit will be used for both lighting and power purposes. A 50-hp junior engine, direct-connected to a 30-kw generator, has been ordered for installation in the Binghamton (N. Y.) municipal lighting plant. Two 85-hp, three-cylinder gas engines direct-connected to 50-kw generators have been requisitioned for installation in the Pittsburg department store of Joseph Horne. The engines are to operate on natural gas. The outfits are intended to furnish power for lighting purposes. Among the foreign contracts received within the last few days by the Westinghouse interests is one for two 75-hp automatic engines and one of 25-hp capacity for the Mexican Petroleum Company, at El Bano, Mexico. These engines will be belted to generators.

MACHINE TOOLS, ETC., FOR TOKYO STREET RAILWAY SHOPS.—The Tokyo Shigai Tetsudo, which is now building an electric traction system in Tokyo, Japan, has placed contracts through the Japanese house of Okura & Co., New York offices, Bowling Green Building, 11 Broadway, for several American machine tools, etc., for installation in the machine shops of the road. The tools will be operated electrically. Twenty-one labor-saving devices have been requisitioned for. Manning, Maxwell & Moore, 85 Liberty Street, New York, were allotted the contract for lathes, which will be built by the W. F. & J. Barnes Company, of Rockford, Ill. The Morse Twist Drill & Machine Company, New Bedford, Mass., has also taken an order for its specialties. The Niles-Bement-Pond Company, 136 Liberty Street, New York, has taken a shaper order. The General Electric Company got a motor order.

BALL ENGINE ORDERS.—The Emery Estate, of Cincinnati, Ohio, has placed an order with the Ball Engine Company, Erie, Pa., for two 200-hp tandem compound, self-oiling engines, arranged for direct connection to Westinghouse generator, to be used in the Mercantile Library Building. The Douglas Electric Company, Douglas, Wyoming, has purchased two 80-hp direct-connected engines from the Ball Engine Company. The Belvidere Hotel, Baltimore, Md.,

will have a large electric plant, consisting of three engines of 600 hp direct-connected to Crocker-Wheeler generators, the Ball Engine Company, Erie, Pa., supplying the engines, which will be of the self-oiling type. The Kentucky Wagon Company, Louisville, Ky., has placed an order with the Ball Engine Company, for a 150-hp self-oiling engine arranged for direct connection to a James Clark, Jr., & Co., generator.

WESTINGHOUSE EQUIPMENT FOR CORDOBA.—Segura, Braniff & Co., of Orizaba, Mexico, who are the contractors for lighting that city, and have a complete plant there and a large water power in the vicinity of the city, have secured a contract for the furnishing of Cordoba with electric light. The initial installation will be 50 arc lamps and 1,000 incandescents. The Mexican firm has also undertaken to supply all the electric power that may be required for Cordoba. The plant at Orizaba, from which transmission will be made to Cordoba, is of Westinghouse build, the contract for which equipment was taken by G. & O. Braniff & Co., of Mexico City, who represent the Westinghouse interests in the southern republic. The new Cordoba plant will also be equipped with Westinghouse machinery. The distance between Orizaba and Cordoba is sixteen miles.

SOUTH AMERICAN ELECTRICAL TRADE.—A dispatch from Berlin, Germany, which has been given considerable publicity, says: C. A. Coffin, of the General Electric Company, and Mr. W. G. Clark, of the British Thomson-Houston Company, are here discussing with the Allgemeine Electricitäts Company, the largest electrical works on the continent, the basis of a non-competitive agreement. Herr Rathenau, director-general of the Allgemeine Company, it is understood, announced that the Allegemeine would not surrender its individuality, but he said he was willing to treat for geographical spheres of interest on the lines of the Atlantic shipping agreement. Messrs. Coffin, Clark, Rathenau and Louis Magee, manager of the Union Company, have had daily conferences, which are likely to result in the General Electric taking Latin America in return for certain unnamed considerations.

BELL TELEPHONE OUTPUT.—The American Telegraph and Telephone Company instrument statement for month ended April 30 and since December 20 compares with previous years as follows:

	1903.	1902.	1901.
Gross output	104,429	108,242	72,396
Returned	43,491	37,587	33,177
Net output	60,938	70,655	39,219
Since Dec. 20:			
Gross output	410,390	387,795	288,505
Returned	160,137	152,085	122,604
Net output	250,253	235,710	165,901
Total outstanding	3,400,573	2,761,720	2,118,717

MEAD CONVEYING MACHINERY ORDERS.—John A. Mead & Co., New York offices Bowling Green Building, has secured a contract for a coal and ash-handling plant for installation in the Omaha & Council Bluffs Railway power station. The capacity of the machinery will be 45 tons per hour. A contract has also been received from the Union Traction Company, of Indiana for coal and ash-handling machinery for its power station at Anderson. The Ingersoll-Sergeant Drill Company's new plant at Phillipsburg, N. J., which is to be electrically equipped, will be installed with Mead coal and ash-handling machinery.

ENGINES FOR NEW A. S. & W. PLANT.—The American Steel & Wire Company has just let a contract for engines to be installed in its new shops at Worcester, Mass. The contract calls for four duplex engines of 325-hp capacity each. The award was made to the American Engine Company, builders of the American Ball engine at Bound Brook, N. J., whose New York offices under the management of Mr. E. S. Boyer, are in the White Building, Liberty Street. These engines will be direct-connected to generators not yet contracted for. The equipment is to be utilized for general power purposes.

INTERNATIONAL PUMP.—The International Steam Pump Company is making extensive improvements on its various plants from the proceeds of the sale last January of $2,500,000 debentures, viz.: At Harrison, N. J., it is erecting the largest machine shop in the world, said to be as long as the Brooklyn Bridge. It will be completed in a year or so, and represents a cost of about $1,500,000. At Buffalo, on the Snow Steam Works, additions are being made to cost $500,000. At Cambridge, Mass., on the Blake Manufacturing Company plant, $300,000 is being spent, and $100,000 for a foundry at the Laidlaw, Dun, Gordon & Co. works, Cincinnati.

NERNST STREET LIGHTING.—Another Wisconsin city has recently decided to light its streets by the Nernst lamp, and for this purpose the city of Oshkosh has recently purchased a supply of these lights through Julius Andrae & Sons Company, of Milwaukee, which is the local agent for the Nernst Lamp Company. The Sewickley Electric Light Company has also just entered an additional order for 20 six-glower Nernst lamps, to be used in extending the street lighting system of the town of Sewickley, Pa., which is said to be already one of the most complete in the country.

AMERICAN BALL ENGINE ORDERS.—The American Engine Company, through its New York offices in the White Building, has just secured a contract for a 11-in. x 19-in. x 14-in. duplex compound engine for direct connection to a 100-kw Crocker-Wheeler generator, which will be used for both light and power in the Brooklyn plant of the Tuttle & Bailey Manufacturing Company. The Sohmer Building, 170 Fifth Avenue, New York, is to be equipped with a 100-hp American Ball engine, direct-connected to a 60-kw generator of General Electric manufacture.

THE WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY has recently sold to the Union City, Winchester & Muncie Traction Company two alternating-current generators which will be used in connection with an extension this latter company is building to the Dayton & Northern division of its line, now operating between Dayton and Greenville, Ohio. When the new extension is completed, through electric cars will be operated from Dayton, Ohio, to Muncie, Indiana.

HARVEY HUBBELL pull clusters have been installed in the State, War and Navy Annex Building, Pennsylvania Avenue and Seventeenth Street, Washington. They have also been put lately into the Carnegie Library, Norwalk, Conn. Harvey Hubbell, Bridgeport, Conn., reports that these clusters are rapidly taking the place of the old style chandelier in stores, offices, etc., on account of the economy in current, wiring, etc., besides the gain in appearance.

MEXICAN HYDRAULIC PLANT.—An hydraulic plant is to be constructed on the Tunal River at a point about four miles distant from the City of Durango, Mexico, for the purpose of generating power for transmission to that city. Mr. Stahlknecht, of Durango, is primarily interested in the syndicate which will build the plant. The initial capacity will be 800 hp. A dam costing about $50,000 will have to be constructed.

ALBERGER CONDENSERS FOR YALE & TOWNE PLANT.—The Alberger Condenser Company, New York, received a contract for high vacuum condensers which are intended to take care of two 500-kw Westinghouse turbines, one of which is already installed in the Stamford (Conn.) plant of the Yale & Towne Manufacturing Company.

EQUIPMENT FOR SPANISH ARSENAL.—The Westinghouse interests have secured a substantial contract for further electrical equipment for the Trubia Arsenal, which turns out the big guns for the Spanish army and navy. The plant is to be considerably extended. The Niles-Bement-Pond Company is also reported to have been awarded a contract for big gun lathes.

THE JENNEY ELECTRIC MANUFACTURING COMPANY.—It is reported from Indianapolis that a syndicate of Indianapolis and Cleveland capitalists have obtained control of the Jenney Electric Manufacturing Company. It will at once expend $150,000 in new buildings and extend the plant. The capital stock has been increased from $80,000 to $450,000.

ALLIS-CHALMERS COMPANY.—The constant menace of labor upon the Allis-Chalmers Company has resulted in the closing down of its plants on the west side of Chicago and the company has withdrawn its plan to expend nearly $1,000,000 on the plants. It is estimated that fully 90 per cent. of the expenditures would have represented labor.

TELEPHONE EQUIPMENT FOR MEXICO.—The purchase of considerable telephone equipment, etc., by the Chihuahua Telephone Company will be necessary, as that concern is to extend the telephone system from the city of Chihuahua to the principal villages located in the State of Chihuahua, Mexico.

THE SHELBY ELECTRIC COMPANY, of Shelby, Ohio, has contracted for a large brick building to be finished by July 15. It will be constructed as a wing of the present plant and will double the capacity, showing a pleasing demand for its product of Shelby lamps.

EQUIPMENT FOR JAPANESE MINES.—The Mitsui Mining Company, Japan, which is controlled by Mitsui & Company, whose New York offices are at 445 Broome Street, will shortly let contracts for considerable American electric equipment, including cranes.

LIGHTING EQUIPMENT FOR MERIDA, YUCATAN.—Felipe G. Canton, whose offices are in the Columbia Building, 29 Broadway, New York, has secured a contract for an electric lighting equipment to be shipped to Merida, the capital of Yucatan.

EQUIPMENT WANTED FOR MEXICAN MINE.—Pedro Alvardo, of Parral, Mexico, is about to let contracts for the electrical equipment of his Palmillo mine.

General News.

THE TELEPHONE.

ST. HELENA, CAL.—The Chiles Valley Improvement Company will construct and operate a telephone line from St. Helena to the Valley.

SANTA MONICA, CAL.—W. L. Porterville, interested in a home telephone company at Long Beach, has applied for a franchise in Santa Monica, to install a $35,000 plant.

SANTA BARBARA, CAL.—The Board of Supervisors has granted a franchise to the United States Long Distance Telephone Company to operate lines throughout Santa Barbara County. An application is now before the City Council for a franchise inside the city limits of Santa Barbara.

WILMINGTON, DEL.—The Citizens' Telephone Company, of New York, with a capital of $50,000, has been incorporated here.

RUSHVILLE, ILL.—The Rushville Telephone Company has been incorporated, with a capital stock of $5,000, and the incorporators are L. A. Jarman, A. P. Rodewald and David G. Glass.

CAMARGO, ILL.—The Home Telephone Company, of Douglas County, has been incorporated with a capital of $4,600. Eugene Rice, G. C. Jeffers and G. C. Wiseman are the incorporators.

GRAYMONT, ILL.—The Graymont Telephone Company and the Friendship Telephone Company, both of this place, have been incorporated, each with a capital stock of $2,500. Mr. L. B. Snyder is interested in both companies.

AUSTIN, ILL.—Determined not to take a dare from his companions, Douglas Drysdale, a ten-year-old boy, climbed a telephone pole and hung by his hands from a telephone wire. His weight pulled the wire down until it came in contact with a trolley wire. The boy was killed instantly by the current and dropped lifeless to the ground.

EVANSVILLE, IND.—Twelve miles of copper wire have been stolen from the Cumberland Telephone Company. The wire was taken down from the poles of the company by men who are installing the new plant.

WARSAW, IND.—The Commercial Telephone Company of this city has increased its capital stock from $30,000 to $50,000. The company contemplates making improvements and extensions.

PLAINFIELD, IND.—The Plainfield and Danville telephone companies have consolidated to be known as the Consolidated Telephone Company, with Dr. Amos Carter, of Plainfield, president. The company will make improvements and extensions and put in a modern switchboard at Danville.

INDIANAPOLIS, IND.—The following new telephone companies filed articles of incorporation recently: The Farmers' White Line Telephone Company, of Mt. Comfort, capital stock $15,000. David Keller, I. W. Wright and others are directors. The McCarty Bell Telephone Company, capital stock $10,000. The principal office will be in Brimfield. W. A. McCarty, C. W. Bliss and others are directors. The Eckhart Telephone Company; J. E. Eckhart and F. M. White are directors. The Orestis Telephone Company; capital stock $7,000. Andrew F. Greenlee and John N. Potter, of Alexandria, are directors. The Oakalla Telephone Company; capital stock $2,000. John F. Johnson and Frank I. Torr are directors. The Range Line Telephone Company, of Hancock County; capital stock $1,600. James H. Binford and Rob't W. Brooks are directors.

ESTHERVILLE, IA.—The Kossuth Telephone Company will build a line westward from Armstrong through this city to Spirit Lake.

ONAWA, IA.—The Onawa & Monona Telephone Company, with a capital stock of $100,000, has been incorporated by Fred Marquis, J. W. Huff, G. W. McMullan, S. B. Martin and C. H. Huntington.

DALLAS CENTRE, IA.—The Farmers' Mutual Telephone Company, of Dallas Centre, has been incorporated, with a capital stock of $20,000, by H. M. Schamel, Will Sehmen, G. F. Rinehart, A. J. Wise, D. G. Hobb, Clyde E. Brenton, O. A. Repars and J. H. Royer.

BALTIMORE, MD.—The South Maryland Telephone Company, under the auspices of the Maryland Development Company, is being formed here.

BALTIMORE, MD.—The Municipal Subway Commission has granted a permit to the Chesapeake & Potomac Telephone Company to construct conduits of its own along North Avenue.

SAULT STE MARIE, MICH.—Frank P. Sullivan and others have applied for a franchise for an independent exchange here. There is considerable indignation against the Michigan Telephone Company (Bell) which has recently raised its rates.

LUDINGTON, MICH.—The Ludington-Scottsville Rural Telephone Company has been organized with $30,000 capital stock. Connection will be made with the lines of the Michigan (Bell) Telephone Company affording long distance service.

MAGNOLIA, MINN.—The Enterprise Telephone Company will build a line from Lismore to Kenneth.

CLEARWATER, MINN.—The Clearwater Telephone Company has been incorporated with a capital stock of $10,000. The officers are: President, G. P. Boutell; vice-president, W. F. Shattuck; secretary, W. Frantzen; treasurer, C. D. Whitmore; manager, J. H. Whitney.

KEARNEY, NEB.—The Buffalo County Telephone Company has been organized with Peter F. Wink as president and J. A. Walters, vice-president.

TRENTON, N. J.—The National District Telephone Company, with a capital stock of $100,000, has been incorporated by S. W. Slayer, Jas. H. Reid, B. A. Judd and R. W. Beard.

GRAND FORKS, N. D.—C. C. Gowran, of this city, has been granted a franchise for a local telephone exchange. Mr. Gowran represents the Twin City Telephone Company.

ALLIANCE, OHIO.—The Central Union Telephone Company is preparing to erect a new exchange here.

KENTON, OHIO.—The Kenton Telephone Company has secured new quarters and will enlarge its switchboard.

YELLOW SPRINGS, OHIO.—The Miami Telephone Company has secured a franchise and will install an exchange at once.

NEWARK, OHIO.—Judge B. M. Critchfield has obtained a franchise to build an independent telephone exchange at Hebron.

OXFORD, OHIO.—The Oxford Telephone Company has secured a franchise to build a number of toll lines throughout Oxford County.

GALION, OHIO.—The new system of the Galion Telephone Company has been completed and the exchange has been opened for business.

ASHLAND, OHIO.—C. W. Garver, of Ashland, has submitted a proposition to the town to install an electric fire alarm and police patrol system.

MARYSVILLE, OHIO.—The Marysville Telephone Company has been incorporated with $50,000 capital stock. George E. Whitney and others are interested.

FLUSHING, OHIO.—The Flushing Telephone Company, of Belmont County, has increased its capital stock from $10,000 to $25,000 and will make needed extensions.

NEY, OHIO.—The Ney Telephone Company, capital $10,000, has been incorporated by O. Welker, Ed. Myers, P. M. Lehman, W. F. Gollen and A. P. Yeagley.

CLEVELAND, OHIO.—The Cuyahoga Telephone Company is securing estimates on the cost of installing a new multiple central energy switchboard. The company contemplates giving party line service.

RAVENNA, OHIO.—The Portage County Telephone Company is preparing to string considerable cable. The company is also planning to build a toll line to Parkman to connect with the new exchange there.

FREMONT, OHIO.—The Fremont Telephone Company is preparing to install a new switchboard which will cost $15,000. The company has 900 telephones in operation and its business is growing very rapidly.

SALEM, OHIO.—The Columbiana County Telephone Company is preparing to make extensive improvements and will carry out its plans as soon as the money authorized by the Federal Telephone Company is secured.

CLEVELAND, OHIO.—Officials of the Cuyahoga and United States Telephone companies announce that the deferred interest on bonds will be paid July 1. It is claimed that the properties mentioned are now in good shape and will be able to take care of the bond interest in the future.

TOLEDO, OHIO.—The Toledo Home Telephone Company has voted to expend $75,000 in improvements. The company now has over 7,000 telephones in use with orders for many more, and it will be necessary to install a large amount of new conduit and overhead lines besides enlarging the switchboard.

CLEVELAND, OHIO.—The United States Telephone Company (long distance) has issued the following statement for the first quarter of 1903. Gross earnings, $88,722; operating expenses, $51,728; net earnings, $36,743; surplus for stock, $11,937. The company is building about 100 miles of additional long distance line in Ohio.

OTTAWA, OHIO.—A considerable portion of the stock of the Ottawa Home Telephone Company has recently changed hands. New officers have been elected as follows: J. V. Duncan, president; W. H. Johnson, vice-president; A. F. Schoch, treasurer, and Wm. Colwell, secretary. The company is planning to make improvements.

CLEVELAND, OHIO.—It is reported that the Federal Telephone Company will buy back the interest in the Columbus Citizens' Telephone Company, which was sold to Columbus parties at the time of the Everett-Moore embarrassment. The company retained an option under which it could buy back the stock at the selling figure plus interest, less dividends, any time previous to July 1, 1903.

CLEVELAND, OHIO.—The Federal Telephone Company is working its way out of its difficulties. A large number of small creditors have accepted a proposition to take cash on a basis of 50 cents on the dollar and a considerable amount of the indebtedness has been cleared up in this way. It is understood that a number of the largest creditors have agreed to a longer extension of time allowing matters to stand as at present until the properties are more thoroughly developed. It is probable that a new holding company will be organized to take over the assets of the present company.

SUMTER, S. C.—The Sumter Telephone Company has increased its capital stock from $2,000 to $10,000.

SHERMAN, TEX.—The Grayson County Telephone Company of this city has increased its capital stock from $170,000 to $340,000.

SALT LAKE CITY, UTAH.—The Utah Home Independent Telephone Company has purchased from the city for $48,000 the property on the corner of First, South and State Streets on which it will erect a three-story fire-proof stone, brick and steel building.

STUART, VA.—The Hillsville & Stuart Telephone Company has been organized to build a line between the two places named touching intermediate points. Construction work has already commenced. Among those interested are Capt. T. J. Banks, of Carroll, T. T. Clark and S. C. Scott.

SPOKANE, WASH.—The International Telephone Company of America, with headquarters at Washington, D. C., has applied to the council for a franchise to operate a telephone system, telephones to the number of 5,000 to be put in free and no party lines to be used.

BLOOMER, WIS.—The Bloomer Telephone Company has increased its capital stock from $8,000 to $15,000.

OSCEOLA, WIS.—The Minnesota Mutual Telegraph & Telephone Company will establish an exchange in this place. This will give Osceola three telephone systems.

SPRING GREEN, WIS.—The West Spring Green Telephone Company, of Spring Green, has been incorporated with a capital stock of $494, by George H. Peck, J. W. Reyman and Samuel Huntley.

ELECTRIC LIGHT AND POWER.

DEMOPOLIS, ALA.—The Demopolis Electric Light & Power Company, F. B. Clement, president, has $10,000 capital and operates a Westinghouse system, with 44 arc and 3,300 incandescent lights.

FORT SMITH, ARK.—The Fort Smith Light & Traction Company, W. C. Lemert, president, operates 50 miles of circuit, with 225 arc lights and 15,000 incandescents, 50 motors at 5 to 15 cents per kw-hour, and 16 cars.

HARRISON, ARK.—The Harrison Electric Light & Ice Company will shortly merge with the Arkansas Traction Company, capital $500,000, bonds $500,000.

PINE BLUFF, ARK.—The Citizens Light & Transit Company was organized in 1901, with $300,000 capital, $100,000 bonds. Geo. O. Martin is superintendent. It operates 200 arc lights, 20 motors at 10 cents per kw-hour and 10 cars. Summer cars and trailers are needed, and an electrical supply business would do well.

SANTA CRUZ, CAL.—The City of Santa Cruz municipal plant furnishes 84 arc lamps.

CORONA, CAL.—Reports from this place are to the effect that there is a good opening for all improvements as there are none now.

SAN BERNARDINO, CAL.—The San Bernardino Gas & Electric Company has $500,000 capital; 220 arc lamps and 4,500 incandescents. It runs 45 motors at four cents per unit.

SAN LEANDRO, CAL.—The Suburban Electric Light Company has $500,000 capital, and operates a long distance transmission plant. There are 150 arc and 15,000 incandescent lights; motors of 500-hp from 3½ to 6 cents per kw-hour, and heating irons.

ONTARIO, CAL.—The Ontario Power Company, organized in 1901, has $500,000 capital stock, $380,000 bonds; L. S. Dyer is president. It runs about 40 motors at two cents to nine cents, according to consumption and supplies 4,000 16-cp incandescent lights. All power not in local use is sold to the Pacific Light & Power Company, of Los Angeles.

OXNARD, CAL.—The electric light department of the Colonia Improvement Company has five enclosed arcs and 2,782 incandescent lamps. An electric railway to haul freight to the ocean front and domestic produce is needed. Mr. Thurston, superintendent, informs us that another independent corporation exists called the Oxnard Suburban Electric Company, which furnishes light for ranch houses and barns.

WESTPORT, CONN.—Following are the rates of the Westport Electric Light Company for incandescent service: For stores, mills, etc., six nights from "early candle light" until 12 o'clock, $1 per month; six nights from early candle light until 11 o'clock, and until 12 o'clock Saturdays, 85 cents per month, for 3 lights or less. Churches, public halls, etc., 25 cents per kw-hour. At this rate a 16-cp lamp costs 1¼ cents per hour, and is equivalent to coal gas at $1.85 per 1000 feet. Meter rates for stores, mills and residences 20 cents per kw-hour for 2250 watt hours or less, which is equivalent to 45 hours use per month for each 16-cp lamp or equivalent. The rate for service exceeding the above limit is 12½ cents per kw-hour.

JACKSONVILLE, FLA., has a municipal plant which furnishes 265 arc lights and runs 40 motors at 7 cents to 4 cents per kw-hour.

PORT TAMPA, FLA.—The Electric Light & Water station is the property of the A. C. L. R. R. There are 17 enclosed arcs and 900 incandescent lights, also two motors of 150-hp.

HOGANSVILLE, GA.—The M. K. Wood plant operates 20 arc lamps and 300 incandescents.

NEWNAN, GA.—The Newnan Light & Power Company, organized in 1901, has $20,000 capital stock, 31 2,000-cp arc lights and 2,000 16-cp incandescents.

MONTEZUMA, GA.—The Montezuma Mfg. Co. bought out the Oglethorpe & Montezuma Light & Power Company, and it is now operated in connection with the first-named. The company is about to install 25 arc lights and operates 600 incandescents.

SHEFFIELD, GA.—The Sheffield Company formed in 1903 with $500,000 capital. Mr. H. Parsons is president. It is doing great work in developing the resources of the place, in building an electric railway, a lighting system and water works in Tuscumbia, Florence and this city. The power station is at Sheffield.

GRANGEVILLE, IDAHO.—The Grangeville Electric Light & Power Company is in the market for a complete outfit of water wheel and electrical apparatus for a new plant.

ST. ANTHONY, IDAHO.—The St. Anthony Water & Light Company was formed in 1903, with a capital of $50,000; W. Vanderveer is superintendent. It operates six 1,200-cp arc lights and 630 16-cp incandescents.

MOSCOW, IDAHO.—The Moscow Electric Light & Power Company contemplates extending its lines to Pullman, Wash., nine miles; to supply 1,000 lights to that place at 10,000 volts and will need transformers and other supplies.

TAMAROA, ILL.—It has been voted to construct an electric light plant by private ownership.

AUBURN, ILL.—The Auburn Electric Light Company operates 23 arc lights and 1,500 incandescents.

NORMAL, ILL.—The electric light plant at this place was seriously damaged by an explosion recently.

ROCKFORD, ILL.—The capital stock of the Central Heat & Power Company has been increased from $50,000 to $100,000.

EARLVILLE, ILL.—The electric plant supplies twenty-five arc lights and 1,800 incandescents. J. T. Wilson is the proprietor.

CANTON, ILL.—The People's Gas & Electric Light Company has increased the number of its incandescent lights to 3,000, mostly of 16-cp.

PEKIN, ILL.—The Pekin Electric Light Company has decided to enlarge its plant. A 300-hp boiler and a 350-hp engine will be installed.

ONEIDA, ILL.—The Oneida Light & Power Company has just been extending its lines. It operates three arcs and 1,300 incandescent lights.

AMBOY, ILL.—The Amboy Light & Power Company, S. H. Wallace, superintendent, operates 25 2,000-cp arcs and 1,100 incandescents. It also runs fan motors. New arc lamps are required.

BLANDINSVILLE, ILL.—The Blandinsville Roller Mill & Light Plant is the property of W. P. Wright. It supplies eight arc lamps and 450 incandescents. Mr. R. L. Moore, chief engineer, notes the need of a 100-hp boiler.

ALPHA, ILL.—The Alpha Electric Light & Power Company operates two arcs and 1,200 incandescent lights. It requires a 125 to 150-hp Corliss engine and 100-hp boiler. An electric railway of 40 miles would be very successful.

ELMWOOD, ILL.—The Elmwood Electric Light Company has $30,000 capital stock and is owned and managed by E. L. Brown. It operates 15 miles of arc circuit with 100 lamps and 12 miles of incandescent circuit, with 3,500 lights.

EVANSTON, ILL.—Northwestern University has leased for a term of ninety-nine years to the Evanston Electric Illuminating Company, all the ground comprised in the block bounded by Benson Avenue and Church, Clark and Maple Streets.

CENTRALIA, ILL.—The Merchants' Co-operative Lighting Company, of Centralia, has been incorporated, with a capital of $5,000, to furnish electric light, heat and power. Incorporators: Wm. B. Smith, O. V. Parkinson and Wm. Benjamin.

FREEPORT, ILL.—The Freeport Railway, Light & Power Company, organized in 1903 with $350,000 stock and $350,000 bonds. It operates a Westinghouse system, with 50 miles of circuit, 100 arc lights of 2,000-cp and 8,000 incandescents. The company also runs 25 motors and five cars.

MOORESVILLE, IND.—S. J. Bolton light plant desires to buy a second-hand direct current dynamo of 600 or 800 lights capacity.

ANDERSON, IND.—The Alexandria Light & Power Company has secured the contract for lighting the city for ten years at $80 per light per year.

ELKHART, IND.—The City Council has granted a franchise to the National Manufacturing Company for an electric light, heat and power plant. Walter Brown is president.

GREENSBURG, IND.—A ten-year franchise has been granted the Greensburg Electric Company by the City Council, to take effect April 1, 1904. The price is $69 per light on an all-night schedule.

MORGANTOWN, IND.—Mr. C. Teeters, proprietor of the electric light plant, wants to change the generator for a larger one to put in 300 more lights.

BLAIRSTOWN, IA.—The Blairstown electric light plant is to be sold. It pays $100 per month over expenses.

ALTA, IA.—The committee on light of the City Council has under consideration plans for enlarging the electric light plant.

ELDORA, IA.—The Eldora Electric Light Company has two miles of mains for steam heating and finds it very successful. It has 27 2,000-cp arc lights and 4,200 incandescents.

REINBECK, IA.—The question of constructing an electric light plant is under consideration. Whether the city will build the plant or let a franchise to private parties is yet undecided.

ASHLAND, KY.—The contract for lighting the streets with electricity has been awarded to the Ashland Electric Light & Power Company at $51 per lamp per year on a ten-year contract.

KENNEBUNK, ME.—The municipal electric light plant was destroyed by fire recently.

HOULTON, ME.—Geo. Ingram is reported interested in the construction of an electric light plant.

MADISON, ME.—The Village Council has instructed the electrical commissioner to procure plans, estimates and bids for the establishment of an electric plant on Sandy River.

HYATTSVILLE, MD.—The citizens have voted to grant the Northern Electric Lighting Company, of New York, N. Y., a franchise to construct an electric light plant in Hyattsville.

OTIS, MASS.—The Selectmen have awarded the contract for lighting the streets for one year to Leominster Electric Light & Power Company at $72 per year, for arc lights to burn till 1 a. m.; for all night arc lights, $110 and for 65 incandescent lights, $16 each.

DURANGO, MEX.—P. E. Stahlnecht, of Durango, writes that it is proposed to develop the power of Tunal River; probable cost of work, $700,000. He will be ready to receive bids for the electric plant in about six months.

CALUMET, MICH.—The Calumet Light, Heat & Power Company has been organized by P. P. Roehm, John Burder and A. W. Kerr to conduct a central heating plant in connection with its electric plant; capital, $80,000.

VULCAN, MICH.—The Wisconsin State Assembly has passed a bill permitting the construction of a dam on Menominee River, near Vulcan. The power of Sturgeon Falls will be utilized and electric power generated to be used in operating mines in the vicinity of Norway and Vulcan.

SOUTH STILLWATER, MINN.—Electric light and water bonds amounting to $23,000 are reported sold.

PELICAN RAPIDS, MINN.—The council is reported to have voted to issue bonds for an electric light plant.

CALEDONIA, MINN.—J. Kenny, village recorder, writes that bids are wanted for an electric light plant; probable cost, $8,000. S. G. Reque, Westby, Wis., is the engineer.

JACKSON, MISS.—Bids are now being received by the Capitol Light & Power Company for furnishing three boilers, engines, dynamos, wire and supplies for the new electric light plant; boilers are to be 150-hp each, of

Scotch marine type, with corrugated furnaces, for a steam pressure of 150 lbs. per sq. in. Bids call for both simple and compound engines. For further information apply to Kirkpatrick & Johnson, engineers.

HACKETTSTOWN, N. J.—The Electric Light Company is stated to have secured the contract for 116 20-cp lights for one year at $1,700 per year.

NEWARK, N. J.—The Block Light Company, of Colorado, capital $50,000, has been incorporated at Newark by William H. Washington, Frederick H. Porter, William M. Shaw, Charles A. Murphy and Pelimon A. Balcom.

FAYETTEVILLE, N. C.—The citizens have voted to issue bonds for water works and an electric light plant.

HENDERSON, N. C.—The contract for lighting the town for a period of 10 years has been awarded to the Henderson Lighting & Power Company for $2,700 per year.

URBANA, OHIO.—The Urbana Electric Light & Power Company has applied for a new franchise in Urbana.

ATHENS, OHIO.—It is stated that bids are wanted by W. B. Golden, Village Clerk, for $15,000 electric light bonds.

PUT-IN-BAY ISLAND, OHIO.—The council has granted an electric lighting franchise to R. K. Ramsay, of Sandusky, who will erect a plant.

COLUMBUS, OHIO.—The Erner Hopkins Company, of Columbus, is stated to have secured the contract for furnishing wire, pole line and sundries for the municipal electric light plant for $18,183.

DAYTON, OHIO.—Engineer C. P. Folsom of Dayton announces that preliminary work is now being done for the development of power on Cumberland River for electrical purposes; the probable cost of work is $2,000,000.

OBERLIN, OHIO.—The plant of the Oberlin Gas & Electric Light Company has been sold to a syndicate of local capitalists. The company has just secured a new franchise from the council. A. E. Hay, of Elyria, will manage the plant.

CLEVELAND, OHIO.—An Eastern syndicate is figuring on establishing an electric lighting plant on the south side with a view of supplying that portion of the city. It is proposed to erect the plant near the new coke ovens of the Cleveland Furnace Company and to utilize the gas from the ovens.

DEFIANCE, OHIO.—A company has been organized at Defiance with $200,000 capital stock to utilize the water power in the Auglaize River near Defiance. An electric power plant will be established at once and the company will endeavor to induce manufacturing establishments to locate in the town.

CLEVELAND, OHIO.—The new city administration will take immediate steps for the establishing of a municipal lighting plant. An ordinance for an issue of $200,000 electric light bonds has already been presented to the council. Preliminary plans for the proposed station have been submitted by Charles E. Phelps, of Baltimore. It is proposed to utilize a part of the old water works station for the generating plant. It is calculated that the required outfit would cost about $375,750, and it is claimed that city lamps could be supplied at $55 per year instead of $75 per year as at present.

OKLAHOMA, OKLA.—The Oklahoma Gas & Electric Company, organized in 1902. The president is A. H. Branch. It operates 116 city and 156 commercial arcs. It also furnishes motor power at 5 cents per kw-hour and power for street railway. The capital is $300,000 and it is bonded for $300,000.

SANGER, ORE.—Surveys and plans are being prepared for the construction of an electric power and light plant; probable cost of plant, $60,000. J. K. Romig, of the Sanger Gold Mining Company, is interested.

HOMESTEAD, PA.—The Mifflin Light & Power Company is about to petition for a franchise in Homestead.

MONTOURSVILLE, PA.—The Borough Council has accepted the proposition of the Montoursville Electric Company to furnish 53 lights at 25-cp each, contract to go into effect July 1.

LEBANON, PA.—Bids will be received until June 1 by I. L. Beckley, City Clerk, for lighting the streets with electricity. There will be required about 135 open or closed arc lights, and not less than 50 incandescent lights, to burn from twilight to dawn. The bids are to be for a period of 1, 5 and 10 years.

GAFFNEY, S. C.—Ladshaw & Ladshaw, Spartanburg, S. C., are preparing plans for a 10,000-hp water power development on Broad River, 11 or 12 miles from this place, estimated to cost $500,000.

AUSTIN, TEX.—The Governor has approved the bill appropriating $155,000 with which to install a water, light and power plant for the State institutions located in Austin.

SOURLAKE, TEX.—The Light & Power Company, of Sourlake, has been incorporated, capital $10,000. Incorporators: D. O. Lively, T. J. Douglas and T. W. Freeman.

VERNAL, UTAH.—E. W. Davis writes in regard to the electric plant for Vernal Light & Power Company that the company is not yet organized. The work will cost about $35,000, and bids for the work will probably be received about July 15.

RICHMOND, VA.—Samuel Cohn has petitioned the Council for a franchise to construct and operate an electric light plant.

WYTHEVILLE, VA.—The Town Council has offered for sale an electric light franchise for Wytheville; also the old plant owned by the town. Bids for both to be opened June 5.

ELLENSBURG, WASH.—The city contemplates improving its municipal light plant, either by increasing its present steam plant, or by constructing a water power, diverting water from Yakima River. A. McL. Hawks, of Tacoma, has been selected to advise upon the project. Geo. Sales is City Clerk.

LANCASTER, WIS.—John Schreiner and others, of Lancaster, have purchased the local electric light plant, and propose changing the present system from a direct to alternating current.

THE ELECTRIC RAILWAY.

DANBURY, CONN.—The Danbury and Harlem Traction Company will increase its capital stock and issue bonds to construct a trolley from this place seventeen miles to Golden's Bridge, N. Y.

WALLINGFORD, CONN.—The Wallingford Tramway Company has been incorporated in Connecticut with a capital of $500,000, to build a trolley line, which is said will be the completing link in a through line from New York City to Boston.

HARTFORD, CONN.—The Woodbury & Seymour Street Railway Company has been chartered to build an electric railway in Woodbury, Southbury, Oxford and Seymour. The company is capitalized at $400,000. The incorporators are Floyd F. Hitchcock and Levi E. Curtis, of Woodbury; Christian Strobel, of Waterbury, and Frederick L. Everil, of Branford.

CHICAGO, ILL.—The Lake Street Elevated Railway Company is having plans made for a new transformer station at Lombard Avenue and Lake Street, to cost approximately $75,000.

MONMOUTH, ILL.—Articles of incorporation has been filed by the Illinois Union Railway Traction Company, with capital stock $500,000. The incorporators and first board of directors are P. E. Elting, of Macomb, Ill.; W. H. Beaver, of Abingdon, Ill.; John W. Andrews, of New York, and W. W. McCullough, W. B. Young and S. S. Hallam, of Monmouth.

MICHIGAN CITY, IND.—The Chicago & South Shore Railway Company has increased its capital stock from $300,000 to $1,000,000. The company will expend the $700,000 in extending its line, which connects Michigan City and LaPorte, east to South Bend.

COLUMBIA, KY.—The Columbia Interurban Railway Company has been organized here, with $15,000 capital stock subscribed. The officers of the company are Prof. W. K. Azbill, president; Capt. W. W. Bradshaw, vice-president; C. S. Harris, secretary; Judge J. W. Jones, treasurer.

LOUISVILLE, KY.—The Louisville Suburban Electric Railway Company is reported to have awarded the contracts for constructing the proposed interurban line from Louisville to Mount Washington to A. L. Rick Company, of Cincinnati. The work will be done under the supervision of the Tennis Construction Company, of Cincinnati.

NEW ORLEANS, LA.—H. H. Pearson, Jr., has been re-elected president of the New Orleans Railway Company, W. W. Miller, of New York, has been chosen first vice-president, and Colonel Joseph H. DeGrange, of New Orleans, second vice-president.

CONWAY, MASS.—The Legislature has a bill before it to authorize the Conway Street Railway Company to buy the property of the Conway Electric Light & Power Company. The bill will probably pass.

WORCESTER, MASS.—The Worcester Consolidated Street Railway Company is securing options on land between Worcester and Leominster, over which it proposes to build a second line to Leominster, by way of West Boyleston and Sterling.

WORCESTER, MASS.—The Worcester & Connecticut Eastern Street Railway Company will absorb the Thompson Tramway Company, the People's Tramway Company and the Danielson & Norwich Street Railway Company, all of which operate in the eastern part of Connecticut. The roads have been controlled by the same interests for some months. The company is granted two years in which to build extensions to unite the roads.

NASHUA, N. H.—The Hudson, Litchfield & Goffs Falls Electric Railway, which is to connect this city and Manchester, has organized as follows: Isaac N. Center, of Manchester, president; Arthur S. Campbell, of Manchester, vice-president; John J. Baker, of Hudson, treasurer. The directors were instructed to proceed immediately with the construction of the road.

ATLANTIC CITY, N. J.—The Central Passenger Railway Company has been incorporated, with a capital stock of $40,000, to build an electric railway here. William McLaughlin, Louis Kuehule, Francis B. Quigley and John A. Jeffries, of Atlantic City, are interested.

ALAMAGORDO, N. M.—Alamagordo Street Railway Company has been organized with $50,000 capital stock, to build and operate a street railway and electric light system. Arthur P. Jordan, William Hodge and Thaddeus H. Llayford, of Alamagordo, are interested.

JAMESTOWN, N. Y.—It is stated that the Jamestown, Chautauqua & Lake Erie Railroad, which runs from Jamestown to Westfield, is to be converted into an electric railway.

NEWBURGH, N. Y.—The Orange County Traction Company is considering the advisability of extending its lines from Walden to Montgomery.

LITTLE FALLS, N. Y.—It is stated that J. M. Farley, of White Plains, is forming a company to build an electric railway from Johnstown to Little Falls. A survey of the line has already been made.

PENN YAN, N. Y.—Lake Keuka and East Side Railroad Company, of Penn Yan, has been incorporated to operate an electric road, thirteen miles long, from Penn Yan to Keuka. The capital is $130,000. Directors: J. C. Harris, New York; M. F. Sheppard, Penn Yan, and D. E. Hoover, Keuka.

TOLEDO, OHIO.—The People's Rapid Transit Company has increased its capital stock to $500,000.

ELYRIA, OHIO.—The Elyria, LaGrange & Southern Traction Company, recently organized to build a line from Elyria to LaGrange, has elected these officers: Wm. Heldmeyer, president; J. M. Starr, vice-president; F. H. Foster, treasurer; H. Wilcox, secretary.

TOLEDO, OHIO.—The Toledo, Port Clinton & Lakeside Railway Company has awarded a contract to the Westinghouse Company for its electrical equipment and with the Erie City Iron Works Company for engines and boilers. A temporary power house will be built at Genoa.

PORTSMOUTH, OHIO.—In addition to building a suburban line to Hanging Rock, the Portsmouth Street Railway & Light Company is planning to make important extensions to its system in Portsmouth. The company will built its new power house at Millbrook Park near Yorktown.

COLUMBUS, OHIO.—The Toledo & Chicago Construction Company has been incorporated, with $10,000 capital stock, by J. R. Seagrave, A. R. Seagrave, U. G. Denman, J. H. Ainsworth and W. F. Courtad. This is the company which will have charge of the construction of the Toledo-Chicago Interurban Railway. Its offices are in Toledo.

READING, PA.—The Metropolitan Electric Company will install a storage battery plant to take care of the heavy travel on its lines during the summer. The plant will include 264 cells.

PHILADELPHIA, PA.—Dallett & Co., of this city, have received the contract for furnishing the electrical equipment for the new cars of the Allentown & Reading Traction Company.

SPARTA, TENN.—It is reported that capitalists are interested in a proposed electric railway from Sparta to Cookeville. A fine water power at Burgess Falls is being examined with a view to its development for power.

BENNINGTON, VT.—At the last session of the Vermont Legislature a charter was granted to the Bennington & North Adams Street Railway Company. The capital stock of the new company is $150,000, with authority to increase. George F. Graves, of Bennington, president of the First National Bank, is interested.

MORGANTOWN, W. VA.—The Morgantown, Fairmont & Cheat River Street Railway Company has been chartered. It is capitalized at $750,000, and the incorporators are Davis Elkins, Jos. H. McDermott, Frank K. Brett, Clarence B. Dille and Thomas R. Dille. About 20 miles of road will be constructed.

NEW INDUSTRIAL COMPANIES.

THE ELECTRIC RECORDING & SIGNAL COMPANY, of Kenton County, has been incorporated in Kentucky with a capital stock of $5,000.

THE PARRY ELECTRIC COMPANY, with a capital of $1,000,000, has been incorporated in Ohio to build an electric railway from Lexington, Ohio, to Zanesville.

THE ONONDAGA AUTOMOBILE COMPANY, of Syracuse, N. Y., has been incorporated; capital, $150,000. Directors: G. L. Gridley, G. E. DeLong, and J. S. Palmer, Syracuse.

THE W. H. GOUGH ELECTRIC COMPANY, of Syracuse, N. Y., has been incorporated with a capital of $40,000. Directors: W. H. Gough, David Cronin and W. G. Holbrook, of Syracuse.

THE ORANGE AUTOMOBILE EXCHANGE AND MANUFACTURING COMPANY, Newark, N. J., has been incorporated, capital $50,000. Incorporators: George J. Althen, B. A. Durham and R. Arthur Heller.

BARTZ, WYGANT & BROWN, Hornellsville, N. Y., have been incorporated to make electric motors and appliances, capital $60,000. Directors: Frank Bartz, Frederick A. Wygant and Alfred E. Brown, Hornellsville.

THE MARQUETTE ELECTRIC COMPANY has been organized at Augusta, Me., to manufacture electrical machinery. The capital stock is $100,000 and the officers are: President, F. L. Dutton; treasurer, E. F. Whittum.

THE URBAN CONSTRUCTION COMPANY, of Deerfield, Wis., has been incorporated to build gas and electric lighting plants. The capital stock is $10,000 and the incorporators are H. B. Fargo, Gilman Peterson and Charles E. Pierce.

THE METROPOLITAN ENGINEERING COMPANY, of New York, has been incorporated to deal in electrical advertising devices; capital, $30,000. Directors: Frederick W. Jesser and Alexander H. Laidlaw, Brooklyn; Maitland E. Elliott, of Manhattan.

THE KARAS ELECTRIC COMPANY has been incorporated at Chicago, Ill., with a capital stock of $10,000 for the purpose of manufacturing electrical, mechanical and chemical specialties. The incorporators are Leland C. Summers, Bertrand S. Summers and Joseph Karas.

THE AMERICAN STEEL & ELECTRIC COMPANY has been incorporated under the laws of New Jersey, with a capital stock of $125,000 to engage in the manufacture of electrical supplies. The incorporators are Bertil Von Philip, Harry L. Ogden and J. M. Thorn.

THE ON-LEE BURNER MANUFACTURING COMPANY has been incorporated in New York City to manufacture arc and incandescent illuminating lamps and supplies. Capital $5,000. Directors: Wm. H. Batterson, Jersey City, and Leon Pistner and Max Bernstein, of New York.

THE INDIANAPOLIS ELECTRIC MANUFACTURING COMPANY, Indianapolis, Ind., has incorporated to carry on an electrical manufacturing business and to furnish motive power and apparatus. The capital stock is $10,000. Henry E. Kattman, Ansel Fatout and C. E. Morgan are directors.

THE DUQUESNE MOTOR CAR COMPANY has been incorporated at Buffalo, N. Y., for the purpose of manufacturing, selling, leasing and otherwise dealing in automobiles and automobile parts. The capital stock is $50,000 and the directors are Harry Howe, Harry G. Johnson, L. Ray Pelletier, John Fraser and John B. Uster.

THE NATIONAL CHEMICAL POWER COMPANY has been organized at Prescott, Ariz. Among other objects, it will engage in the generation of electricity for power and lighting purposes by means of a chemical process. The capitalization is $25,000,000. The incorporators are John H. Carruthers, Otto Koehler and Oscar Bergstrom.

THE J. L. MOTT COMPANY has been incorporated under the laws of New Jersey, with a capital of $3,000,000, to manufacture and deal in plumbing, steam fitting and electric fixtures. Incorporators, who are identified with the Jordan L. Mott Iron Company, of New York, which is about to establish a large manufacturing concern in Trenton, are Jordan L. Mott, Jordan L. Mott, Jr., John Reid, Augustus Mott, and Knox Goebel, of New York, and O. O. Bowman, of Trenton.

OBITUARY.

MR. J. F. STAUFFER.—Brief note was made in our columns recently of the death of Mr. John Forney Stauffer, the president of the Geo. C. Towle Manufacturing Company, of Lancaster, Pa. Mr. Stauffer was born in Penn township, Pa., on Aug. 6, 1845, and was the son of Benjamin Miller Stauffer and Sophia (Forney) Stauffer who was a cousin of John W. Forney, the founder of the Philadelphia *Press*. Mr. Stauffer's ancestors came from Switzerland about 1790. He was married to Clara S. Fondersmith, whose great-great grandfather was Ludwig von der Schmidt, a descendant of the house of Hesse-Darmstadt, who was a manufacturer of guns in Germany for the government and came to Lancaster County in 1749; and his son John manufactured guns for the war of 1812. The deceased had two sons, Charles F., a prominent contractor of Lancaster and B. Grant, secretary and treasurer of the Geo. C. Towle Mfg. Co. Mt. Stauffer, previous to going into the electrical business, was a contractor for railroads, water works, etc., and many of the engineering feats of eastern Pennsylvania were accomplished by his ability. At his death he was president of the Geo. C. Towle Mfg. Company and the American Spring Water Company and a member of several social organizations. The business of the Geo. C. Towle Mfg. Company will be continued by the same general management.

PERSONAL.

MR. A. ANDERSON has been appointed general manager of the Albany Electric Illuminating Company, of Albany, N. Y.

MR. W. S. ACCLES, European manager of the Niles-Bement-Pond interests, left for Europe May 27 on the American liner *New York*, after some weeks' sojourn on this side.

MR. E. O. EDSON has become secretary and treasurer of the Bendit Mercantile Engineering Company, 714 Wainwright Building, St. Louis. Mr. F. C. Laufketter has retired to assume the presidency of the Victor Manufacturing Company of St. Louis. The Bendit concern represents a valuable line of mechanical and engineering specialties.

LT.-COL. CUBILLO, principal of the Spanish government arsenal at Trubia, sailed for Europe May 27 on the American liner *New York*, after several weeks' visit on this side. The Trubia arsenal is already equipped with considerable Yankee electrical machinery and machine tools and Col. Cubillo during his Yankee electrical machinery and machine tools and Col. Cubillo during his present trip has placed orders for further equipment, some particulars of which appear elsewhere in this issue. Shortly after his return to Spain it is anticipated that further substantial contracts will be sent to various American manufacturers of machinery, etc.

Mr. W. E. PARK, manager of the Johannesburg offices of Fraser & Chalmers, Limited, of London, will arrive in the States shortly for the purpose of placing substantial contracts. Fraser & Chalmers, Limited, acquired the British and Colonial manufacturing and selling rights of Fraser & Chalmers, of Chicago prior to that concern entering the Allis-Chalmers Company. Among the American firms represented by the Fraser & Chalmers people in South Africa are the Rand Drill Company; the Wheeler Condenser & Engineering Company; the Sullivan Machinery Company; the Knowles end of the International Steam Pump Company; the Jones & Laughlin Steel Company; the Chapman Valve Manufacturing Company and the Robins Conveying Belt Company. They also look after the South African business of the British firm of Dick, Kerr & Company.

PRESIDENT JOHN I. SABIN, of the Pacific States Telephone & Telegraph Company, recently returned to San Francisco from Chicago where he managed the affairs of the Bell companies for two years during which there was a great increase in the business of the lines in and around Chicago. Louis Glass, the vice-president and general manager of the Pacific system, is still traveling in the Orient, and Mr. Sabin will at once take active steps to improve the service throughout the coast as well as in San Francisco. The exchange facilities in that city will be increased from the present capacity of 45,000 to 100,000 subscribers' stations. San Francisco had on May 1, 40,287 subscribers and the entire coast system 164,540. This shows quite a rapid increase. The company has taken off its solicitors and ceased to advertise, pending the proposed extensions of the system in San Francisco. There is only one city on the Coast, and probably in the United States, that has more telephones in proportion to the population than San Francisco, that is Bakersfield, Cal., where is is 1 to 20. The great number of oil wells is largely responsible for this, as there is a telephone at every pump in the oil districts. The projected independent telephone companies in San Francisco and Oakland are not being heard from at present, although the persons promoting the enterprises had good financial backing it is said. Mr. Sabin is quoted as saying that he does not fear competition in the long run.

MR. FRANK L. MIDDLETON, who, for the past three years has been prominently identified with the sales and correspondence departments of the Stromberg-Carlson Telephone Manufacturing Company has resigned from that company to accept a similar position as manager of the sales department with the International Telephone Manufacturing Company. Mr. Middleton has had a broad and practical experience in the telephone field, having twenty years ago, while a boy, started in as night operator and later as inspector by the Central Union (Bell) Telephone Company, at Elkhart, Indiana. He soon rose to the position of manager of that exchange and remained with this company for a period of about eight years. At the opening of the independent

field, he took up this line of work in the organizing of the Elkhart (independent) Telephone Company, which put in one of the first independent exchanges in the country. After the completion of this plant, he assumed the management of the Merchant's Mutual Telephone Company, of Michigan City, Indiana. He later resigned to assist in the organization and take charge of the construction of the independent exchange at Waco, Texas, which is considered one of the largest and best built exchanges in the Southwest. At the completion of this plant, Mr. Middleton resigned the management of this company to enter the manufacturing field in the offices of the company from which he has just resigned. The International Company, being now well established in the manufacture of a complete line of central energy and generator-call telephones, together with switchboard systems for any size exchange, including all the most modern conveniences and embodying in the construction of the parts many new features that are of importance to the durability as well as the efficiency of a telephone plant, will enable Mr. Middleton to continue to serve his many friends in the business.

Trade Notes.

THE GENERAL INCANDESCENT ARC LIGHT COMPANY has removed its Chicago office to a suite of rooms on the twelfth floor of the Marquette Building.

ARNHOLD, KARBERG & CO., of China, have removed their offices from 50 Wall Street to more commodious quarters at the Battery Park Building, State Street, New York City.

THE SHELBY ELECTRIC COMPANY, of Shelby, Ohio, has broken ground for an addition 30x100 feet and two stories high. This will about double the capacity of the plant.

FILTERS FOR STEEL CORPORATION.—Two large Cross oil filters were recently ordered from the Burt Mfg. Co., Akron, Ohio, by the U. S. Steel Corporation, making 114 now in use in its different mills.

THE ELBLIGHT COMPANY OF AMERICA has called attention to the fact that its system and fittings are specifically included in the list of approved fittings for decorative lighting by the National Board of Fire Underwriters in the 1903 National Code.

REMOVAL.—The A. G. Schoonmaker Company will, on or about June 1, move its offices and warerooms to 29 West Street, New York. The company will have at its new quarters increased facilities for handling its business and more commodious and convenient warerooms.

MASHINTER ELECTRIC CO., of Buffalo, N. Y., has moved its place of business from 12 Perry Street, in that city, to 62 Niagara Street, where it will carry a full line of electrical supplies, and will be fully equipped there for every class of electrical construction, armature winding and repair work.

THE WARD-LEONARD ELECTRIC COMPANY, Bronxville, N. Y., manufacturers of rheostats and circuit breakers, reports a large number of orders from the New England states for its DK type circuit breakers for use in automobile stations. On account of its special features and extremely low cost the breaker is very popular.

THE ECK DYNAMO & MOTOR WORKS, Belleville, N. J., are kept busy filling the constantly increasing orders for their well known dynamos and motors of various sizes. The present demand for their new universal fan motors shows the interest this newest production in fan motors has created. It is a highly ingenious mechanism.

THE LUNKENHEIMER COMPANY, Cincinnati, reports that on account of the unprecedented demand for its superior line of brass and iron steam specialties, it has been compelled to increase its foundry output 50 per cent. Machine tools of the most improved type are being installed in various departments as fast as they can be obtained.

THE AMERICAN BALL BEARING COMPANY, Cleveland, Ohio, manufacturer of ball bearings for automobiles and other purposes finds itself cramped for space and has purchased a six-acre site on the West Side near the Lake Shore & Michigan Southern tracks where it will erect a three-story factory. Considerable new machinery will be installed and all of it will be electrically driven. A power plant consisting of a 250-hp cross compound engine direct-connected to a 150-kw alternating current generator will be installed, as well as a number of independent motors.

THE UNIVERSITY OF WISCONSIN, at Madison, Wis., has recently removed the arc lamps from the gymnasium, and substituted eighteen six-glower Nernst lamps, making a considerable gain in both the quantity and quality of the illumination. Other educational institutions throughout the country are also adopting the Nernst lamp, notably the State Normal School, of Westfield, Mass., which has lately installed 75 single-glower Nernst lamps.

MASURITE COMPANY.—The Masurite Explosive Company announces the removal of its offices from 50 Broadway, New York City, to its manufacturing plant at Masury, Ohio. This will enable the executive and managing departments to be in closer touch with the manufacturing end of the business and the company feels that it will thus be in a position to give better care to the interests of its patrons. The company's post office address is Sharon, Pa.

THE NEW TELEPHONE WIRE now being sold by the Electric Appliance Company, Chicago, is of the celebrated "O. K." manufacture. It is a two conductor, glazed braid, made with trace thread in one conductor, then twisted. It is carried in Chicago in black, maroon and nut brown colors, No. 18 B. & S. copper. This insulation does not rot or deteriorate and if we may believe the Appliance Company, is cheaper than many rubber wires of greatly inferior quality.

THE UNITED ENGINEERING & FOUNDRY COMPANY, of Pittsburg, installed last year a complete heating and ventilating equipment in the roll shop of the Lincoln foundry department. The apparatus, which was furnished by the B. F. Sturtevant Company, consists of a steel-plate exhauster direct-connected to a horizontal, side-crank engine. The exhauster draws air from out-of-doors through a large steam heater built up in sections of one-inch pipe, one of the sections receiving the exhaust from the fan engine.

TELEPHONE CONTRACTS.—The De Veau Telephone Manufacturing Company, 27 Rose Street, New York, announces that it has just closed a contract for a complete telephone system for the Willard Hotel in Washington; also for a camplete telephone plant for Luna Park, Coney Island. It has also received a large order for telephones from the New York Central Railroad Company. The De Veau Company is just about to ship a complete telephone plant to Alaska.

AN ART SOUVENIR.—The Swedish-American Telephone Company, of West Jackson Boulevard, Chicago, has combined art and science most skillfully and effectively in its new catalogue, which will be mailed upon request. The book is one of the most artistic ever undertaken in the telephone field and is certain of an enthusiastic reception wherever introduced. The cover, paper, stock, illustrations, border designs, printing, etc., are all perfect in their way. Every telephone man will want the "Art Souvenir," and can get one.

PROVED BELTING.—A half century's constant use in thousands of the leading factories of the United States has proved the worth of "Royal Worcester" belts. The Graton & Knight Manufacturing Company is to be congratulated on the reputation that its belting has secured by its honest work all through this long period of time, and any manufacturer who desires to secure the best of belting will do well to write for prices and facts about "Royal Worcester." Inquiries are invited and full data will be furnished promptly.

THE BENJAMIN ELECTRIC MFG. COMPANY, of Chicago, exhibited its wireless clusters and electrical specialties at the Auditorium Hotel, Chicago, the present week, during the convention of the National Electric Light Association. Many interesting features were shown. On account of the rapidly increasing demand for its products the Benjamin Company found it necessary to establish its office and factory in larger quarters, and therefore moved to its present location, 141 South Clinton Street, where with increased facilities, it will be able to supply the demand for its goods.

LATEST DEVELOPMENTS IN TELEPHONY is the title of a bulletin just issued by the International Telephone Manufacturing Company, of Chicago. It gives illustrations of the company's full line of apparatus for large and small public and private central energy and generator-call telephone plants, with a clear description of the many improvements embodied in the construction of the various parts. The pamphlet is artistically arranged and will interest all who are engaged in the telephone operating and constructing field.

THE DALE COMPANY, manufacturer of electric fixtures and other electrical specialties, is now located in its handsome new building at 9th Avenue, 13th and Hudson Streets, New York, where no expense has been spared to make it the model plant of its kind in this country. New machinery of the latest type has been added and the new show rooms are splendidly appointed. Mr. J. H. Dale has recently acquired all of the outstanding shares in the Dale Company and now owns exclusively all the stock. Mr. O. J. Bryan, sales manager, will shortly make an extended trip to the West in the interests of the company.

BANNER ELECTRIC COMPANY.—The stockholders of the Banner Electric Company held their annual meeting recently and elected these officers: President, J. Evans Lippincott; vice-president, Thomas Carr; treasurer, O. U. Cassady; superintendent, F. C. Kirchner; secretary and general manager, N. L. Norris. The above with R. T. Hamilton, C. S. Cook are directors. The affairs of the company were reported in a very prosperous condition and the output of the plant has been increased materially in the past year. There was a substantial earning on the capital invested, but the directors decided to allow this to remain in the treasury for future developments.

THE CALCULAGRAPH CO., New York, recently changed its quarters to a more commodious location at 15 Maiden Lane, where it has been for some little time past. From its new offices the view is superb; and its floor space is also increased. It has recently issued a partial list of purchasers and users of instruments, which looks like a miniature telephone directory. The use of the calculagraph in telephone work has shown wonderful results. According to a statement made by Mr. Henry Abbott, president of the company, 16 instruments sold to one telephone company earned in one month $1,126.20, this sum being for toll charges on excess minutes that had previously been unrecorded.

THE F. BISSELL COMPANY, Toledo, Ohio, since moving into its new building, No. 226-230 Huron Street, reports an overwhelming amount of business; its trade in switchboards, time switches and other specialties being especially heavy. It carries in stock a complete line of telephone and electric light supplies and ships orders promptly. The Northern Electrical Manufacturing Company's line of motors and dynamos has recently been added to the list and sales on this line are also heavy. The Cleveland office, No. 709 New England Building, is in charge of Mr. A. B. Mann, who looks after machinery business in that locality. The company will be glad to send copies of its excellent catalogues to any address.

HART & COMPANY, of Chicago, makers of the Red Cross lubricant for commutators, are finding a very gratifying demand for this new commutator lubricating stick, which now has the endorsement of over 15,000 electricians and engineers. Full sized sticks are five inches long and ⅞ inch in diameter. A trial is all that is asked. This company is also furnishing the Langleben brush. This is a carbon brush, which contains a sufficient percentage of graphite to make it self-lubricating and soft enough to secure a good contact on the commutator at all times. It is especially adapted to use of stationary motors and generators. Besides the carbon brush, this company carries a stock of superior bronze woven wire brushes.

MAGNET STEEL.—The use of high grade permanent magnet steel is constantly increasing, and A. C. Leslie & Co., Merchants Bank Building, Montreal, Canada, report that they are finding a large demand for "Remy" brand of imported steel, for which they are agents. They state that this brand has been adopted by nearly all the leading manufacturers of electrical instruments in the United States, as well as by a number of telephone companies and other classes of electrical concerns requiring magnet steel. The "Remy" brand is produced in Germany from pure Swedish stock, the makers having had a specialty in this for more than a generation. They are indeed said to be the largest producers of finished magnets from which fact they derive a practical experience that is most valuable to them in checking the quality of their steel. In addition to importing this steel on special order, the firm of A. C. Leslie & Co. has arranged to carry a certain quantity in stock at New York.

TELEPHONE CATALOGUE.—The Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y., and Chicago, Ill., has just issued a very handsome and artistic bulletin entitled, "Interurban Telephones." The catalogue contains descriptions and illustrations of telephone and switchboard apparatus for railway and interurban lines. Views are given showing the practical use of the instruments on such railways. As has already been noted in these columns, the Detroit United Railway Company uses the telephone system of despatching. A description of this system is also included in the bulletin, together with various views of telephone booths along the line, and the switchboard at headquarters. An excellent half-tone view represents one type of the instrument in use on the line of the Trenton & New Brunswick Railway Company. All of the illustrations in this catalogue are of the highest class and are very complete in detail and clearness. Altogether the bulletin is one of the most finished and attractive ever issued on this particular branch of the subject. Two fine views of the company's factories at Chicago and Rochester are given, and the front cover is a work of art. This company's apparatus has been especially designed to meet the most exacting requirements of perfect communication at all times between the various departments of railway companies, requiring reliability and efficient service.

Record of Electrical Patents.

UNITED STATES PATENTS ISSUED MAY 12, 1903.

[Conducted by Wm. A. Rosenbaum, Patent Attorney, 140 Nassau St., N. Y.]

726,476. ELECTRICAL DISTRIBUTION AND SELECTIVE DISTRIBUTION; John Stone Stone, of Cambridge, Mass. App. filed April 4, 1894. (See page 928.)

727,764. ELECTRICAL PROTECTIVE DEVICE; Edward B. Ellicott, of Chicago, Ill. App. filed Dec. 17, 1901. (See page 928.)

727,829. CABLE-TERMINAL; Joseph J. O'Connell, of Chicago, Ill. App. filed Oct. 13, 1902. (See page 928.)

727,880. TELEPHONE SPECIAL DIRECTORY; Lewis M. Bannan, of San Francisco, Cal. App. filed April 3, 1902. (See page 928.)

728,060. SWITCHBOARD INCANDESCENT LAMP; Allen D. Whipple, of Chicago, Ill. App. filed Jan. 27, 1902. (See page 928.)

728,195. SECTIONAL COVER FOR BOXES; Thomas H. Brady, New Britain, Conn. App. filed Jan. 12, 1903. A fuse box having a sectional cover, any number of the sections of which can be removed at the same time.

728,202. STORAGE BATTERY; Alfred W. Charlton, Toronto, Can. App. filed Oct. 6, 1902. A rectangular lead tube containing a lead core having four wings in contact with the four corners of the tube.

728,210. ELECTROLYTIC ARC-LIGHT; William T. Dean, of Chicago, Ill. App. filed November 15, 1901. (See Current News and Notes.)

728,222. BRUSH HOLDER; Henry Geisenhoner, Schenectady, N. Y. App. filed Dec. 19, 1900. Details.

728,231. LAMINATED LEVER SWITCH; Edward M. Hewlett and Charles C. Badeau, Schenectady, N. Y. App. filed Dec. 16, 1898. The blade which enters between the jaws of the terminals also carries laminated bridging contracts which rub against the outer faces of the terminals.

728,242. LIGHTING DEVICE FOR INCANDESCENT GAS BURNERS; James Keith and George Keith, London, Eng. App. filed Aug. 19, 1902. Details.

728,243. WIRELESS TELEGRAPHY; James F. King, New York, N. Y. App. filed Feb. 5, 1902. Automatic apparatus for rendering the transmitting devices inoperative at such times as the receiving apparatus is in operation.

728,254. FACSIMILE TELEGRAPH; Hans Liebreich and John C. Francis, Detroit, Mich. App. filed June 14, 1900. Transmitting points and receiving points are mounted to rotate about an axis and are connected by a single main line; high tension currents are used for writing purposes and low tension current for synchronizing purposes.

728,256. BRUSH FOR DYNAMO ELECTRIC MACHINES; Walter D. Litchfield, Schenectady, N. Y. App. filed Nov. 23, 1900. Each brush is made up of a number of carbon blocks overlapping each other.

728,259. SYSTEM OF ELECTRICAL DISTRIBUTION; Alexander D. Lunt, of Schenectady, N. Y. App. filed Nov. 30, 1900. (See Current News and Notes.)

728,273. BRUSH HOLDER; Edgar W. Mix, Paris, France. App. filed March 22, 1900. Details.

728,274. ELECTROLYTIC CELL; Hugh K. Moore, Lynn. Mass. App. filed Aug. 29, 1901. The connections with the anode are made of disimilar metal and so joined that their different coefficients of expansion under heat will cause the joints to maintain firm electrical contact.

728,278. TELEPHONE-WIRE HANGER; Herman F. Neslage and Harry H. Watson, of St. Louis, Mo. App. filed July 14, 1902. (See page 928.)

728,292. ELECTRIC ELEVATOR; Frank B. Rae, Chicago, Ill. App. filed Nov. 16, 1895. A brake circuit is operated from the car independently of the motor circuit.

728,293. CIRCUIT BREAKER; Robert H. Read, Schenectady, N. Y. App. filed July 27, 1901. Means for locally generating fluid pressure by which an insulating fluid may be forced across the arc when the circuit is opened.

728,299. SYSTEM OF ELECTRICAL DISTRIBUTION; Edwin W. Rice, Jr., of Schenectady, N. Y. App. filed Jan. 2, 1901. (See Current News and Notes.)

728,300. ELECTRIC REGULATOR; Edwin W. Rice, Jr., of Schenectady, N. Y. App. filed Nov. 5, 1902. (See Current News and Notes.)

728,301. MOTOR BRACKET FOR PRINTING PRESSES; Frank E. Rich, Chicago, Ill. App. filed July 2, 1902. Details of construction.

728,313. TROLLEY; George E. Smith, Exeter, N. H. App. filed April 5, 1902. A small wheel is mounted in a frame normally pressed upwards by a spring. A trolley finder first directs the wire to the small wheel after which the spring on the trolley arm forces the main wheel into place.

728,321. SYSTEM OF ELECTRICAL DISTRIBUTION; Charles P. Steinmetz, of Schenectady, N. Y. App. filed Jan. 2, 1901. (See Current News and Notes.)

728,322. SYSTEM OF ELECTRICAL DISTRIBUTION; Charles P. Steinmetz, of Schenectady, N. Y. App. filed Jan. 2, 1901. (See Current News and Notes.)

728,324. THIRD RAIL ELECTRIC RAILWAY; Samuel B. Stewart, Jr., Schenectady, N. Y. App. filed July 5, 1902. A third-rail guard consisting of a roof plate and a rod beneath the rail, the latter supported in the insulators and serving as a foot-guard.

728,325. SYSTEM OF ELECTRICAL DISTRIBUTION; Charles W. Stone, of Schenectady, N. Y. App. filed Oct. 23, 1901. (See Current News and Notes.)

728,342. TELEPHONE-RECEIVER; George E. Wheeler, of Burlington, Ia. App. filed June 19, 1902. (See page 928.)

728,343. MAGNETO GENERATOR; George E. Wheeler, Burlington, Iowa. App. filed June 19, 1902. Details of a laminated core for the armature.

728,344. TELEPHONE-RECEIVER; George E. Wheeler, of Burlington, Ia. App. filed July 31, 1902. (See page 928.)

728,350. TELEPHONY; Robert H. Yurgae, of Milwaukee, Wis. App. filed Nov. 24, 1902. (See page 928.)

728,357. ILLUMINATOR FOR SURVEYING INSTRUMENTS; Carl M. Bernegau, Hoboken, N. J. App. filed March 20, 1902. A tubular handle carrying a small lamp, reflector and lens at its extremity.

728,372. POLE CHANGER; John Crawford, Denver, Colo. App. filed April 26, 1902. The construction involves a barrel switch in combination with fixed contacts.

728,381. STORAGE BATTERY; Mary Emme, New York, N. Y. App. filed March 11, 1902. The electrodes are placed in the earth which is then saturated with a suitable electrolyte.

728,440. PURIFYING APPARATUS; Pierre J. Boucher, Cleveland, Ohio. App. filed Oct. 16, 1902. Method of mounting electrode plates in a tank in which liquids are electrically treated.

728,442. ELECTRIC INSULATOR; Edward J. Burke, Olyphant, Pa. App. filed May 22, 1902. A conical split plug between the parts of which the wire is clamped, is driven into a V-shaped cross-passage in the head of the insulator.

728,523. CIRCUIT BREAKER FOR HOISTS; Samuel S. Wales, Munhall, Pa. App. filed Feb. 19, 1903. An actuating connection is arranged between the main circuit breaker and a switch in a safety circuit.

728,528. PROCESS OF TREATING KAOLIN FOR THE PRODUCTION OF CARBORUNDUM AND ALUMINA; Frederick C. Weber, Chicago, Ill. App. filed Nov. 3, 1902. Consists in forming silicon carbid and aluminum carbide from kaolin, then subjecting the product to the action of water forming methane and aluminum hydrate and then separating by washing the hydrate from the chrystalline carborundum.

728,537. DEVICE FOR ACTUATING AND CONTROLLING ELECTRIC MOTORS; Otto C. Britsch, Maspeth, N. Y. App. filed Nov. 28, 1902. The starting switch and brake of a sewing machine motor are operated from a treadle.

728,540. MOTOR CONTROL SYSTEM; Frank E. Case, Schenectady, N. Y. App. filed Jan. 6, 1902. Apparatus for rendering it impossible to improperly operate the motor controlling switch in a multiple unit system.

728,544. ELECTRIC SIGNALING DEVICE; George E. Clark, Northampton, Mass. App. filed Aug. 16, 1902. Details.

728,546. MAXIMUM DEMAND INDICATOR; Frank P. Cox, Lynn, Mass. App. filed March 2, 1899. In a maximum demand instrument for three wire systems, an arrangement consisting of a tube, expansible fluid therein acting as an indicator, a coil included in circuit with each of the outside mains for heating the fluid, the two coils acting simultaneously and with an effect corresponding to the current flowing.

728,564. ELECTRIC RESISTANCE STRUCTURE; Henry Geisenhoner and Tycho Van Aller, Schenectady, N. Y. App. filed Nov. 10, 1900. A fur-

nace in which a free circulation of the heated air among the coils is obtained so that the interior chamber may receive the full benefit of all the heating coils.

728,565. BRUSH HOLDER; Henry Geisenhoner, Schenectady, N. Y. App. filed Dec. 20, 1900. Details.

728,567. APPARATUS FOR APPLYING TERMINAL WIRES TO ELECTRIC LAMP GLOWERS; Joseph M. Gulentz, Pittsburg, Pa. App. filed April 10, 1902. Apparatus whereby the ends of the terminal wires may be forced into the ends of the glower blank when the latter is in a soft condition.

728,568. METHOD OF APPLYING TERMINAL WIRES TO ELECTRIC LAMP GLOWERS; Joseph M. Gulentz, Pittsburg, Pa. App. filed April 10, 1902. Covers the method carried out by the preceding apparatus.

728,570. REGULATOR FOR ALTERNATING SERIES ARC LIGHT SYSTEMS; Josef H. Hallberg, New York, N. Y. App. filed Sept. 30, 1902. A fixed transformer and a movable reactance coil have their cores formed from the same body of iron.

728,575. TRANSFORMER; George H. Hill and Sydney G. Brown, Montreal, Canada. App. filed June 7, 1902. A medical apparatus comprising a cautery, a light and a shocking coil, each having their own leads and means, including a safety cut out, for connecting all of the coils to the source of energy.

728,579. SYSTEM OF DYNAMO ELECTRIC MACHINES; Frank H. Jeannin, Schenectady, N. Y. App. filed Oct. 28, 1901. Sources of electromotive force in series with each other, a consumption circuit in a lead extending between two of said courses and a regulating circuit connected to one terminal of the consumption circuit and to another lead extending said sources.

728,581. TRACTION SYSTEM; Ernst L. K. F. Kahlenberg, Charlottenburg, Berlin, Germany. App. filed Feb. 27, 1899. An induction motor having a resistance of predetermined value permanently included in circuit with its armature, is provided with means for increasing the pressure of the source of current supply when the car requires more than the normal amount of torque to propel the same.

728,648. ELECTRIC LAMP; Alexander J. Wurts, Pittsburg, Pa. App. filed June 19, 1901. It is stated that grooves formed in the frame surfaces adjacent to the glower, break up or prevent continuity of the deposit of platinum black on said surfaces and therefore prevents short circuits.

728,659. COLLECTOR FOR USE ON ELECTRICALLY PROPELLED OR LIGHTED VEHICLES; Benjamin H. Dedell, London, Eng. App. filed May 16, 1902. A magnet mounted on the car has pole pieces carrying spring supported fingers which are normally withdrawn from the roadway, but when presented to an iron button in the roadway, are pulled downward into contact to establish electrical connection between the button and car.

728,667. STORAGE BATTERY; John C. Brocksmith, Chicago, Ill. App. filed Jan. 14, 1902. Details.

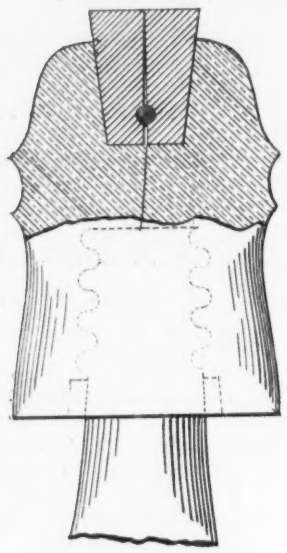
728,752. ELECTRICAL DISTRIBUTION; Samuel L. Naphtaly, Edward C. Jones and Frank H. Varney, San Francisco, Cal. App. filed Sept. 12, 1901. Transformers are automatically cut into and out of circuit according to the load.

728,766. WINDING FOR ELECTRICAL MACHINES AND APPLIANCES; Raymond Rouge, Paris, France. App. filed Oct. 10, 1902. The peculiar details of this winding can best be obtained from the patent itself.

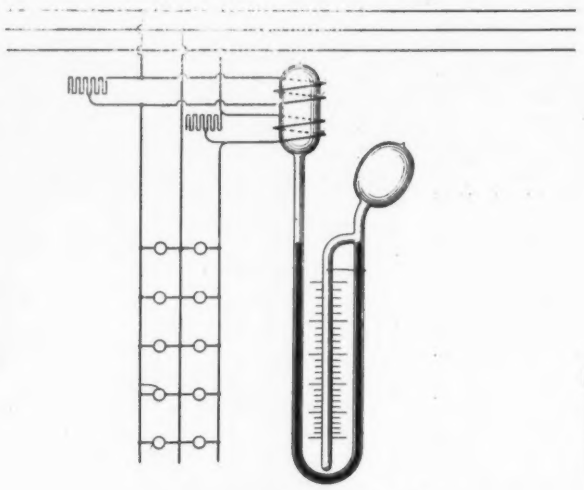
728,778. PRODUCTION OF CHROMIUM COMPOUNDS AND ALKALIES; Heinrich Specketer, Griesheim-on-the-Main, Germany. App. filed July 1, 1901. The process consists in electrolyzing solutions of the salts of the alkalies with an anode containing chromium while preventing the mixing of the anode and cathode electrolyte and adding to the anode electrolyte a neutralizing agent.

728,780. CONDENSER; Charles F. Splitdorf, New York, N. Y. App. filed Aug. 4, 1902. A stack of layers of alternate foil and dielectric material is rolled up in such a manner that the inner ends of the foil are all in contact while their outer ends are all exposed, so that terminals can be respectively connected with them, the inner terminal consisting of a post around which the roll is formed and the outer terminal consisting of a binding wire for the roll.

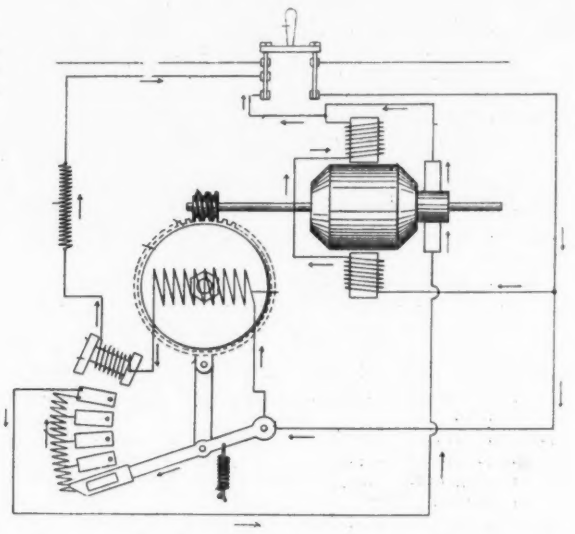
728,785. TELEPHONE SYSTEM; Ernest Umdenstock, of Reading, Kan. App. filed April 21, 1902. (See page 928.)



728,442.—Electric Insulator.



728,546.—Maximum Demand Indicator.



728,814.—Device for Automatically Cutting Out Starting Resistances of Electric Motors.

728,590. LOCK FOR CONTROLLER HANDLES; John B. Linn, Schenectady, N. Y. App. filed Jan. 29, 1901. An inspector boards the car at boundary points between city and suburban districts and fixes the limits of movement of the controller handle so that the motorman cannot run faster than is permitted in each district.

728,596. EQUALIZING BRUSH HOLDER; Edwin J. Murphey, Lynn, Mass. App. filed Oct. 4, 1901. The support for the brushes is permitted to move when the relative pressure of the brushes upon the commutator varies.

728,611. SYSTEM OF MOTOR CONTROL; William B. Potter, Schenectady, N. Y. App. filed Jan. 24, 1901. In a pneumatic system, a device for causing a quick movement of a valve consisting of a solenoid whose core strikes a hammer blow upon the valve.

728,612. MEANS FOR COMPENSATING TEMPERATURE CHANGES IN ELECTRICAL MEASURING INSTRUMENTS; William H. Pratt, Lynn, Mass. App. filed Dec. 12, 1902. A thermo-electric couple having the joints exposed to the same temperature conditions as the shunt joints and connected with the instrument terminals so as to provide an opposing thermo-electromotive force.

728,614. CURRENT COLLECTOR; Edward D. Priest, Schenectady, N. Y. App. filed Dec. 2, 1901. A number of collecting rings and spacing rings between them are clamped together and against an end flange by means of one pressure collar.

728,632. CONTACT-BREAKER; Charles F. Splitdorf, of New York, N. Y. App. filed September 19, 1902. (See Current News and Notes.)

728,647. HEATER CUTOUT FOR ELECTRIC LAMPS; Alexander J. Wurts, Pittsburg, Pa. App. filed July 7, 1900. The solenoid core which operates the cutout, is connected to the cutout bar in such manner that it is tilted in the core space to rest against the walls thereof and prevent its noisy vibration when the lamp is operated by alternating currents.

728,789. ELECTRIC HEADLIGHT LAMP; Harlan P. Wellman, Ashland, Ky. App. filed Jan. 3, 1903. Details.

728,797. CIRCUIT BREAKER OR SWITCH FOR HIGH POTENTIALS; Edward M. Hewlett, Schenectady, N. Y. App. filed Feb. 11, 1899. The terminals are located in a narrow tube and are separated with a sudden and extended movement.

728,805. INSULATOR; Fred M. Locke, Victor, N. Y. App. filed Jan. 29, 1902. The insulator has an upper surface in the form of a flattened cone around which there is a gutter to carry off moisture.

728,812. RECTIFIER; William Stanley, Pittsfield, Mass. App. filed March 10, 1897. Details of construction.

728,814. DEVICE FOR AUTOMATICALLY CUTTING OUT STARTING RESISTANCES OF ELECTRIC MOTORS; George H. Whittingham, New York, N. Y. App. filed July 8, 1902. A magnetic clutch is interposed between the armature shaft and the rheostat lever; when the resistance is all out, the clutch releases and thereafter runs free.

728,817. STARTING ALTERNATING CURRENT MACHINES; Jonathan E. Woodbridge, Schenectady, N. Y. App. filed Oct. 11, 1901. Means for reducing the normal electromotive force before impressing the same upon the machine in starting.

728,820. CIRCUIT MAKING AND BREAKING DEVICE; Alexander J. Wurts, Pittsburg, Pa. App. filed April 17, 1901. Details.

728,821. HEATER CUT OUT FOR ELECTRIC LAMPS; Alexander J. Wurts, Pittsburg, Pa. App. filed March 14, 1901. Details.

12,113. RAILWAY SIGNAL; Jonathan D. Price, Aurora, Ill. App. filed April 23, 1901. A system in which the track rails are utilized as a part of the circuit for operating signals located on the train.